ENCLOSURE 1

EXAMINATION REPORT - 50-302/OL-85-04

Facility Licensee: Florida Power Corporation
P. O. Box 14042, M.A.C. H-2
St. Petersburg, FL 33733

Facility Name: Crystal River 3

Facility Docket No.: 50-302

Written and oral examinations were administered at Crystal River Nuclear Plant near Crystal River Florida.

Chief Examiner: Bruce A. Wilson — 1/29/86
Bruce A. Wilson — Date Signed

Approved by: Bruce A. Wilson — 1/29/86
Bruce A. Wilson, Section Chief — Date Signed

Summary:

Examinations on November 21 and 22, 1985

An oral examination was administered to one candidate; The candidate passed. Seven candidates were administered written re-examinations of all categories; Five candidates passed. One candidate was administered a written reexamination of one category. The candidate passed.

REPORT DETAILS

1. Facility Employees Contacted:

*J. Alberdi, Manager-Site Nuclear Operations Technical Services
*L. C. Kelley, Nuclear Operations Training Manager
*R. C. Zareck, Nuclear Operations Instructor

*Attended Exit Meeting

2. Examiners:

*B. A. Wilson, NRC Region II
D. P. Falconer, NRC Region II

*Chief Examiner

3. Examination Review

At the conclusion of the written examinations, the examiners provided the facility with a copy of the written examinations and answer keys for review. The following comments were provided by the licensee by letter dated November 26, 1985.

a. Reactor Operator Examination

(1) Question 1.5(c)

The answer on the key is correct, however, an increasing positive startup rate would also be indicative of a supercritical reactor.

RECOMMENDATION:

Accept "constant" or "increasing" for full credit.

Response: Question states "...several seconds after the reactivity addition is terminated."; therefore, only a constant startup rate is an acceptable answer.

Resolution: No change to answer key.

(2) Question 1.10

I feel the answer "To prevent steam bubble formation in the head" should be adequate for full credit on this question. The pressurizer response is a function of the steam bubble, not the cooldown rate.

RECOMMENDATION:

Accept "To prevent steam bubble formation in the head" for full credit.

Response: "To prevent steam bubble formation in the head" is an acceptable answer for full credit.

Resolution: Changed answer key to reflect recommendation.

(3) Question 2.10 (c)

Excessive memorization. An operator is not expected to recall the power supply of all components at the MCC level. Nor is this required of the operator per the RO Job Analysis.

RECOMMENDATION:

Delete question from exam.

Response: The intent of the question is to determine if candidates know that SW pumps 2A and 2B are not powered from Engineered Safeguards MCC's.

Resolution: No change to question or answer key.

(4) Question 2.15 (c)

This is an irrelevant question. Under no conceivable circumstances would an operator ever need to know, or even care, how many heating elements are contained in a pressurizer heater bundle.

RECOMMENDATION:

Delete question from exam.

Response: Question was not adequately supported by NUREG-1122, K/A Catalog.

Resolution: Deleted question 2.15(c)

(5) Question 2.15 (d)

This answer is correct, however, I feel "480V Plant Aux Bus" should also be accepted. AP-770, Pg. 5, Step 7, provides instructions for reenergizing the pressurizer heaters from the B ES 4160 volt bus VIA the 480V Plant Aux Bus.

RECOMMENDATION:

Accept "B" ES 4160 Volt Bus or 480 Volt Plant Aux Bus.

Response: A review of plant reference materials supports recommendation.

Resolution: Changed answer key to accept "480V Plant Aux. Bus" for full credit.

(6) Question 2.19

This question requires an unreasonable level of recollection. RC Pump operation is infrequently performed and governed by a detailed step-by-step procedure. To expect an operator to recall from memory the details of every limit and precaution is unreasonable and counter productive.

RECOMMENDATION:

Delete question from exam.

Response: The limits and precautions for restart of a RCP are not provided in AP-380 and AP-380 does not direct the operator to an appropriate reference procedure; therefore, we assume that this information is within the knowledge of the operator.

Resolution: No change to answer key.

(7) Question 3.1(4)

The answer "0 psig" is identified as correct, however, "50 psig" could also be correct. To make "0 psig" the only totally correct response the question should reference "TBV's not closed."

RECOMMENDATION:

Accept "0 psig" or "50 psig" for full credit.

Response: A review of plant reference material supports this recommendation.

Resolution: Changed answer key to reflect recommendation.

(8) Question 3.3(A)

Either the SG/RX Demand station or the ULD station could be correct answers depending on how far along in the startup the operator assumed he was.

RECOMMENDATION:

Accept "SG/RX Demand" or "ULD" for full credit.

Response: A review of utility reference materials supports recommendation.

Resolution: Changed answer key to accept "ULD" or "SG/RX" station for full credit.

(9) Question 3.3(d.1)

Low Load and Startup control valves freeze when the MBV is not closed.

RECOMMENDATION:

Accept "Control Valves" for full credit.

Response: A review of utility reference material supports recommendation.

Resolution: Changed answer key to also accept "Control Valves" for full credit.

(10) Question 3.4

EFIC actuation A and B each send close signals to the Main Block Valves independently. If EFIC A and B are listed as separate signals, they should be accepted as correct.

RECOMMENDATION:

Accept EFIC A and EFIC B as separate answers.

Response: A review of utility reference material supports recommendation.

Resolution: Changed answer key to accept "EFIC A" or "EFIC B" actuation for full credit

(11) Question 3.7(a)

As installed, HPI blocks 3 and 4 (not 5) were required to set the RB Spray Permit. A subsequent modification has removed the block 3 requirement. Only HPI block 4 is now necessary. This modification did not change the function or operation of the Permit and it is scheduled to be covered in an upcoming requal. session. Some operators may be aware of this modification, others may not. I feel either "block 3 or 4" or "block 4" should be acceptable as correct. In any event, "block 3 and 5" is incorrect.

RECOMMENDATION:

Accept either "Block 3 and 4" or "Block 4" for full credit.

Response: Reference material to support plant modification was not provided to support recommendation to accept HPI Block 4 only for full credit. Indication of HPI Block 5 on the answer key was a typographical error.

Resolution: Changed answer key to "HPI Block 3 and 4".

(12) Question 3.10(a)

Three possible answers:

1. Bleed off temp $\geq$170°F.
2. Seal stage pressure drop $\geq$2/3 RCS Pressure.
3. Loss of both seal injection and component cooling.

RECOMMENDATION:

Accept any two for full credit.

Response: A review of utility reference material supports recommendation.

Resolution: Changed answer key to also accept "Loss of both seal injection and component cooling" as one of two correct answers.

(13) Question 3.11(c)

EFW would initiate. The Loss of All Reactor Coolant Pump actuation cannot be bypassed until Rx power is $<$10%. By procedure, the bypass is removed prior to reaching 200°F. At 450°F the bypass would not be in effect.

RECOMMENDATION:

Delete question from exam.

Response: Question inappropriately referenced heatup instead of cooldown.

Resolution: Deleted Question 3.11(c)

(14) Question 4.1(a)

This is a very confusing way to ask this question. The word "identical" forces one to remember the steps word-for-word rather than through the memory aids many operators use to recall immediate actions.

RECOMMENDATION:

Suggest that you reword this question for future use. No specific change recommended this time.

Response: None

Resolution: No change was recommended.

(15) Question 4.1(c.iv)

The runback limit for 1 RC Pump is "a. 75%"

RECOMMENDATION:

Accept "a. 75%" for full credit.

Response: AP-543 specifically states that the plant will stabilize at approximately 70%. We recognize that the ICS lesson plan states 75%; therefore, if the procedure is incorrect, it should be changed.

Resolution: No change to answer key.

(16) Question 4.2(a)

OP-502 is designed to fit several circumstances and therefore lists several unnecessary steps that the operators may leave out. Also, the specific sequence of the first 6 steps is not important as long as MANUAL is selected before SEQ-OR. The list should read:

1. Select MANUAL
   Select ROD Group
   Select ALL (optional)
   Select AUX
   Select SEQ-OR
   Select JOG
2. Verify SYNC
3. Select CLAMP
4. Select MANUAL TRANSFER
5. Select CLAMP RELEASE
6. Select GROUP
7. Select RUN (if desired)

NOTE: Depressing TRANSFER RESET is not required in this situation since you do not need to clear the transfer logic until you remove the rods from the AUX power supply.

RECOMMENDATION:

Accept some form of the above for partial credit.

Response: A review of utility reference materials supports recommendation.

Resolution: Changed answer key to reflect recommendation.

(17) Question 4.7

This question does not ask the operator to state the plant subcooling margin requirements, therefore, "Loss of adequate subcooling margin" should be all that is required for full credit on this question.

RECOMMENDATION:

Accept "Loss of adequate subcooling margin" for full credit.

Response: The Immediate Action step includes the subcooling margin requirements. If the candidates do not state those requirements in their answers, we are unable to determine if they know them.

Resolution: No change to answer key.

(18) Question 4.9

This question is not reasonable. Many of the variables and allowable deviations in the plant curve book are not linear with power. To expect a man to recall the allowable deviation drawn on a curve from memory is not reasonable. An operator should be expected to be able to predict what vital parameters should be for various load levels, recognize if they vary from expected values, and use the curves or better yet, historical data to determine if they are within tolerance.

RECOMMENDATION:

Delete question from exam.

Response: An operator should be able to predict what vital parameters should be for various loads and recognize if they vary from expected values. Question will not be deleted; however, full credit will be given for answers within established margin.

Resolution: Changed answer key to give full credit for answers within ±2°F or ±2 psig of the setpoint and within ±1°F or ±1 psig of the tolerance.

(19) Question 4.14

The question specifically addresses (quotes) Immediate Action 1. The answer key addresses Immediate Actions 1, 2, and 3. Only the valves listed in Immediate Action 1 should be required for full credit. In addition, a steam line break on the "A" OTSG could depressurize the "B" OTSG due to the fact that they are cross connected thru the turbine steam chest with the plant on the line, or due to reverse heat transfer from the steam generator to the RCS as the primary loops cool down. Because of this, it should be acceptable if an operator lists the isolation valves for both OTSG's rather than just one.

RECOMMENDATION:

Accept the valves listed for Immediate Action 1 for one or both OTSG's for full credit.

Response: MSV-55 is required to be closed manually by the operator; therefore, we agree that it should not be included in the correct answer and also that OTSG "B" may be subject to depressurization.

Resolution: Deleted MSV-55 from answer key and changed answer key to accept valves on OTSG A or OTSG A and OTSG B.

SENIOR REACTOR OPERATOR EXAMINATION

(1) Question 5.3

Same comments and resolution as Question 1.10.

Response: Same as Question 1.10.

(2) Question 5.9(b)

This answer is TRUE. The steady state and transient limits for QPT are MORE restrictive for Power Range Channels than the Symmetrical Incore Detectors.

RECOMMENDATION:

Change correct answer to 'TRUE'.

Response: We agree with utility recommendation.

Resolution: Changed answer key to accept 'TRUE'.

(3) Question 5.11

This question makes no sense as written. The word RATIO should be deleted.

RECOMMENDATION:

Reword question prior to reuse. No specific change recommended here.

Response: No change requested.

(4) Question 5.14(D)

Increasing pump flow rate by opening the discharge valve should decrease NPSH, thereby INCREASING cavitation.

RECOMMENDATION:

Accept "INCREASING" for full credit.

Response: A review of utility reference material supports recommendation.

Resolution: Changed answer key to accept INCREASING.

(5) Questions 6.1 and 6.2

These two questions require excessive memorization of interlocks associated with infrequently used equipment. A fuel handling bridge has over 50 different interlocks. The major interlocks are tested by procedure (SP-532) when the bridges are in use. The operation of the bridge is governed by a procedure which is required to be maintained on the bridge with the operator. There is no reason an operator should be expected to recall from memory the interlocks associated with the bridge.

RECOMMENDATION:

Delete questions from exam.

Response: 10 CFR 55.22(h) states that senior operator written examinations will include questions on fuel handling facilities and procedures. Fuel handling interlocks are mechanisms utilized to prevent fuel damage during fuel handling operation and should be within the knowledge of the senior reactor operator. Also, NUREG-1122 lists fuel handling design features and interlocks at a sufficiently high importance rating.

A review of the reference material (STM-29 and FP-601) revealed the answer key to be incomplete. There are several additional interlocks which will be acceptable for credit in response to question 6.2.

Resolution: No change to question or answer key for question 6.1
Accept additional interlocks for question 6.2 as per STM-21; Tables 3-3, 3-4, and 3-5.

(6) Question 6.8

Same comments and resolution as Question 2.19.

Response: Same as Question 2.19.

(7) Question 6.11(4)

Same comments amd resolution as Question 3.1(4).

Response: Same as Question 3.1(4).

(8) Question 6.13(a)

Same comments and resolution as Question 3.7(a).

Response: Same as Question 3.7(a).

(9) Question 6.15(c)

Same comments and resolution as question 3.11(c).

Response: Same as Question 3.11(c).

(10) Question 6.16(c)

The "Reactivity Alert" indicates either of two conditions:

1. Rx tripped and all rods not in after 3 seconds.
2. Rx tripped and SR count rate $\geq$ 1000 CPS after 25 minutes.

RECOMMENDATION:

Change answer key to reflect correct answer above.

Response: A review of utility reference material supports recommendation.

Resolution: Changed answer key to:

1. Rx tripped and all rods not in after 3 seconds
2. Rx tripped and SR count rate $\geq$1000 CPS after 25 minutes.

(11) Question 7.1

Answer should read LBPR Retainer and Source Retainer.

RECOMMENDATION:

Change the answer key to reflect correct answer above.

Response: Typographical error deleted 'and' from answer key.

Resolution: Changed answer key to accept LBPR retainer and source retainer.

(12) Question 7.4

This question requires detailed memorization of specific steps of a fuel handling procedure. Furthermore, the operation being called for is one rarely, if ever, done. The question is inappropriate to an SRO examination since it gives no indication of a man's ability to operate or direct the operation of the plant.

RECOMMENDATION:

Delete question from exam.

Response: Question was not adequately supported by NUREG-1122, K/A Catalog.

Resolution: Delete Question 7.4.

(13) Question 7.6

Same comments and resolution as Question 4.1.

Response: Same as Question 4.1.

(14) Question 7.10

Same comments and resolution as Question 4.9.

Response: Same as Question 4.9.

(15) Question 7.12

Requires memorization of specific steps of infrequently performed operating procedure.

RECOMMENDATION:

Delete question from exam.

Response: Question is designed to test the operator's knowledge of the system.

Resolution: No change to answer key.

(16) Question 7.13

Same comments and resolution as Question 4.14.

Response: Same as Question 4.14

(17) Question 7.14(a)

Same comments and resolution as question 4.2(a).

Response: Same as Question 4.2(a).

(18) Question 8.17

No facility Comment

Response: Knowledge of 10 CFR 50, Appendix J was required to answer the first part of the question. Delete first blank and change point value to 0.5.

(19) Question 5.08

No facility comment

Response: This question was deleted prior to the start of the examination since it was found to test the same learning objectives as Question 5.01.

4. Exit Meeting

At the conclusion of the site visit, the examiners met with representatives of the plant staff to discuss the results of the examination. The individual who was administered the oral examination was identified as a clear pass on the oral examination.

There were no generic weaknesses noted during the oral examination.

The cooperation given to the examiners and the effort to ensure an atmosphere in the control room conducive to oral examinations was also noted and appreciated.

The licensee did not identify as proprietary any of the material provided to or reviewed by the examiners.

OFFICIAL USE ONLY - PRIVACY ACT INFORMATION

ENCLOSURE 2

POWER PLANT EXAMINATION RESULTS SUMMARY

REQUAL

FACILITY	Crystal River
DATE OF WRITTEN	11-21-85
DATE OF ORALS	11-22-85
DATE OF SIMULATOR	
EXAMINERS	Falconer/ Wilson
TYPE OF EXAM	Requal (COLD) (HOT)

Overall Results	Total No.	Passed No.	Passed %	Failed No.	Failed %
Senior Operator	5	3	60	2	40
Reactor Operator	2	2	100	0	0
Single Ro Cat	1	1	100		

1. Reactor Operator
2. Senior Reactor Operator Instant
3. Senior Reactor Operator Upgrade
4. Reactor Operator Retake
5. Senior Reactor Operator Retake
6. Instructor Certification
7. Senior Reactor Operator Fuel Handling

NAME	DOCKET NO.	TYPE CODE	1	2	3	4	TOTAL	5	6	7	8	TOTAL	Examination Results / Examiner's Initials RO W	RO O	RO S	SRO W	SRO O	SRO S
Bergstrom, C. W.	8226		86.0	85.7	79.2	79.4	82.5						P					
Kirk, D. A.	7810		98.0	93.4	73.7	93.8	89.7						P					
Kasper, L. P.	8232				88.5								P					
Eggleston, D. B.	5407							64.6	55.3	67.3	83.7	67.7				F		
Stephenson, W. A.	8769							87.5	62.0	74.4	79.6	76.1				F	P	
Griffith, P. E.	4491							85.4	81.8	72.3	83.7	80.8				P		
Miller, T. A.	5421							91.7	76.5	70.0	82.7	80.2				P		
Fields, D. A.	9042							81.3	79.2	74.4	96.9	84.0				P		

EXAMINATION RESULTS

P = Passed
F = Failed
W = Waived

EXAMINER'S INITIALS

Only initials of examiner who actually administered the examination

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Key

ENCLOSURE 3

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

Facility: Crystal River Unit 3
Reactor Type: B & W 177
Date Administered: November 21, 1985
Examiner: D. Falconer
Candidate: _____

INSTRUCTIONS TO CANDIDATE:

Use separate paper for answers. Write answers on one side only. Staple question sheet on top of the answers sheets. Points for each question are indicated in parenthesis 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 four (4) hours after the examination starts.

Category Value	% Total	Score	% Value	Category
24 ~~25~~	____	____	____	5. Theory of Nuclear Power Plant Operation, Fluids and Thermodynamics
24.5 ~~25~~	____	____	____	6. Plant Systems: Design, Control & Instrumentation
24 ~~25~~	____	____	____	7. Procedures-Normal, Abnormal, Emergency Radiological Control
24.5 ~~25~~	____	____	____	8. Administrative Procedures, Conditions and Limitations
97 ~~100~~	____	____	____	TOTALS

Final Grade _____%

All work done on this exam is my own, I have neither given or received aid.

_____
Applicant Signature

CATEGORY 5 - THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS AND THERMODYNAMICS. (25.0)

5.01 Indicate how natural circulation will be affected by each of the following situations. Consider each one separately and answer INCREASE, DECREASE, or NO EFFECT.

a. Reduction of turbine bypass valve setpoint (0.5)

b. Decrease in OTSG level (0.5)

c. Reduction of feedwater temperature (0.5)

d. Increase in RCS pressure (0.5)

5.02 An ECP is calculated for a reactor startup four hours after a reactor trip from 100% equilibrium conditions. For each of the following situations, indicate if the actual critical rod position would be HIGHER, LOWER or NO CHANGE from the calculated critical rod position. Consider each situation separately and assume no other changes.

a. The startup is delayed until eight hours after the trip. (0.5)

b. The actual boron concentration is 50 ppm lower than that used to calculate the ECP. (0.5)

c. Tavg is 535°F as compared to the value of 532°F used in the calculation. (0.5)

d. OTSG level is stable at 40 inches on the startup range. (0.5)

5.03 Why should RC cooldown on natural circulation not exceed 10°F/hr for Tc >280°F? (1.0)

5.04 Assume that the reactor is at 100% power, beginning of life, with Group 7 rods 90% withdrawn. Indicate if Group 7 must be INSERTED or WITHDRAWN to maintain the reactor at 100% power for the following evolutions. (See APSAR Worth Curve, ~~Figure 1.13~~ 3.9, attached).

a. the insertion of Group 8 from 36% to 15%. (0.5)

b. the withdrawal of Group 8 from 50% to 80% (0.5)

5.05 Indicate if either DNBR or Pressure Boundary protection are provided by the following Reactor Protection System Trips.

a. RCS Pressure-High (0.5)

b. RCS Pressure-Low (0.5)

c. Reactor Coolant Pump Power Monitors (0.5)

d. Nuclear Overpower Based on RCS Flow and Axial Power Imbalance (0.5)

5.06 Indicate if the severity of the following accidents INCREASE or DECREASE with a positive moderator temperature coefficient.

a. Rod Ejection Accident (0.5)

b. Steam Line Break (0.5)

c. Loss of Feedwater (0.5)

d. Rod Withdrawal Accident (0.5)

5.07 Tcold and Group 7 insertion affect the excore power range calibration. Indicate if reactor power determined by the excore detectors will be LESS CONSERVATIVE or MORE CONSERVATIVE with the following conditions.

a. increasing Tcold (0.5)

b. inserting Group 7 (0.5)

5.08 [MC] Which one of the following factors will help, rather than hinder, natural circulation? (1.0)

a. Lowering OTSG level

b. Lowering RCS pressure

c. Increasing RCS temperature

d. Lowering turbine bypass valve setpoint

Delete - BKW

5.09 Answer the following statements concerning core power distribution and thermal design limits, TRUE or FALSE.

a. Hot Channel Factors (F_Q and $F\Delta H$) are only monitored once for each new core prior to exceeding 75% Full Power. (0.5)

b. The Quadrant Power Tilt Limits are more restrictive when measured by Power Range Channels than by the Symmetrical Incore Detector System. (0.5)

c. Power distribution limits are based on maintaining minimum DNBR, peak linear power density and LOCA analyses criteria. (0.5)

5.10 [MC] Which of the following would tend to place the ICS closer to a BTU limit? (1.0)

a. A decrease in feedwater flow.

b. An increase in feedwater temperature.

c. An increase in OTSG pressure.

d. An increase in T_{ave}.

5.11 TRUE or FALSE

Departure from Nucleate Boiling (DNB) ~~Ratio~~ occurs between the nucleate boiling and film boiling regions. (0.5)

5.12 Answer the following TRUE or FALSE concerning the Small Break LOCA analyses and reactor coolant pump trip criteria:

a. The worst case SBLOCA was found to be a cold leg break in RCP discharge piping. (0.5)

b. The analyses assume that the RC pumps remain operating for some time after the break and then are lost by some means (loss-of-off-site power, equipment failure, etc.) (0.5)

c. If the RC pumps remain operating throughout the blowdown and reflood phase, the peak clad temperature criteria (PCT) would not be exceeded. (0.5)

d. With the RCPs lost and only one HPI pump operating, the PCT criteria would be exceeded; with both HPI pumps operating, it would not be exceeded. (0.5)

5.13 The RC Pump power monitors have both high (262%) and low (20.9%) setpoints. The high setpoint is to assure that certain potential faults will not prevent this instrumentation from providing the protection action. What is the bases for the low setpoint? (1.0)

5.14 Net Positive Suction Head NPSH is a measure of the abilfty of a pump to handle liquid without cavitation. For a cavitating pump, state if the following conditions would INCREASE, DECREASE, or NOT CHANGE the cavitation.

a. increase the system's surge tank level (0.5)

b. decrease the ph of the system's fluid (0.5)

c. decrease the temperature of the system's fluid (0.5)

d. increase the fluid's flow rate through the pump by opening the discharge valve (0.5)

5.15 List the four major sources of hydrogen in containment following a LOCA. (2.0)

5.16 [MC] If the equilibrium count rate in a subcritical reactor TRIPLES due to a reactivity change, what happens to the margin to criticality? (1.0)

a. decreases by 1/3

b. decreases by 2/3

c. decreases by 3/4

d. reactor reaches a supercritical condition

5.17 [MC] The following data was obtained during a core refueling.

Number of Assemblies Loaded	Neutron Count Rate
0	40 cps
5	70 cps
10	90 cps
15	115 cps

Select the number of assemblies it will take to reach the minimum critical size. Use the attached graph paper if desired. (Assume equal assembly worth) (1.0)

a. 29 assemblies
b. 23 assemblies
c. 28 assemblies
d. 33 assemblies

5.18 [MC] Which of the following would cause the differential rod worth to increase? (Assume the rod in question remains in the same position and treat each parameter change independently) (1.0)

a. An adjacent rod is inserted to the same height

b. Moderator temperature is decreased

c. Boron concentration is increased

d. An adjacent burnable poison rod depletes

END OF CATEGORY 5

CATEGORY 6 - PLANT SYSTEM DESIGN, CONTROL AND INSTRUMENTATION (25.0)

6.01 List two of the mandatory slow zones for the Main Fuel Hoist and the conditions for which they are imposed. (2.0)

6.02 What four conditions (interlocks - not administrative) must be satisfied to move the Main Fuel Handling Bridge on the trolley? (2.0)

6.03 Transfer switches are used to transfer control from the control room to the Remote Shutdown Panel. List the location of each of these four switches. (1.0)

6.04 [MC] Which of the following is NOT a Main Feedwater Pump Trip. (1.0)

a. Low exhaust hood temperature

b. Low lube oil pressure

c. Loss of governor speed signal

d. Both feedwater booster pumps tripped

6.05 List the automatic actions that occur on a high radiation signal as detected by RMA-11 (waste gas decay tanks discharge to the auxiliary building ventilation system monitor). (1.0)

6.06 Answer the following with respect to the newly installed EFW flow control values; EFV-55, 56, 57, 58.

a. Mode of valve operation (AC, DC, air, or other) (0.5)

b. Failure mode (open, closed, As Is) (0.5)

c. Means for local or manual control (if any). (0.5)

6.07 What is (are) the interlock(s) that ensure condenser vacuum is broken before the EFW pump suction can be shifted from the CST to the hotwell? (1.0)

6.08 The reactor coolant pump motor may be started three (3) times successively from ambient temperature or twice from rated motor temperature. Additional repetitive starts are governed by motor operating temperature. In the absence of thermal devices to determine both rotor and stator temperatures, what are the guidelines for repetitive starts? (1.0)

6.09 Maximum flow for the DH pumps is 4000 gpm. Minimum flow is 80 gpm. What is the maximum time that the DH pump can be allowed to operate continuously in the recirculation mode (80 gpm - 100 gpm). (0.5)

6.10 New ES MCC's have recently been installed at Crystal River; MCC 3A3 and MCC 3B3. State the location of each of these MCC's. Include Aux Bldg elevation and reference a nearby piece of equipment or structure. (1.0)

6.11 The turbine bypass valve/atmospheric dump valves may be biased by a 0 psig, a 50 psig or a 125 psig signal. Indicate which of these bias' apply to each of the four situations below.

1. The reactor and turbine are not tripped, the turbine bypass valves are closed, and header pressure deviation is less than 10 psig. (0.5)

2. The reactor is tripped as indicated by a TRIP CONF light on the Diamond Panel. (0.5)

3. The reactor and turbine are not tripped, and ULD is greater than 15%. (0.5)

4. The reactor and turbine are not tripped, and ULD is less than 15%. (0.5)

6.12 The Unit is at 70% load with the ΔTc Controller in Manual (hand). One RCP trips. Answer the following.

a. Will the Unit run back? Why or why not? (1.0)

b. Will feedwater reratio? Why or why not? (1.0)

6.13 MAR 82-05-01-01 has replaced the existing RB spray actuation circuitry with a new system.

a. List the two sets of conditions, either of which will result in an RB spray PERMIT. (1.0)

b. In addition to the RB Spray PERMIT, what other signal is required for an RB Spray ACTUATION? (0.5)

c. The RB Spray PERMIT, once set, can be reset in anyone of three different ways. List each of these three ways. (1.5)

6.14 MAR 77-07-01-11 resulted in changes in the Turbine Bypass Valve and Atmospheric Dump Controls.

a. The existing -10 to +10 VDC control scheme for the TBV's was changed to a 4 to 20 milliamp DC scheme. What was the purpose of this modification? (1.0)

b. Explain the ICS interlock(s) between the TBV's/ADV's and loss of condenser vacuum. (1.0)

6.15 The EFIC system will automatically initiate EFW upon detection of various abnormal conditions. For each of the following situations explain the reason or interlock that should prevent EFW from automatically initiating.

a. Reactor power is 10% and the only operating feedwater pump trips. (0.5)

b. Power level is 100% and the signal from OTSG 'A' "Low Range" level fails to 0. (0.5)

delete Bate

c. During plant heatup (RC Temp ~ 450°F), the three operating RCP's trip. ~~(0.5)~~

d. At full power an I&C technician causes an HPI actuation of ESAS Channel A only. (0.5)

6.16 Answer the following concerning the Safety Parameter Display System (SPDS). See Figures 3 and 5 attached.

a. Which NI, or combination of NI channels, provide the indication for "% PWR"? (0.5)

b. Which incore, or combination of incores, provide the indication when "Incore Temperature" is selected? (0.5)

c. Following a reactor trip the Reactivity Alert feature of the SPDS actuates. What does this indicate? (0.5)

d. What is automatically displayed on the SPDS whenever a reactor trip occurs (i.e., how does the SPDS respond to a trip)? (0.5)

END OF CATEGORY 6

CATEGORY - 7 PROCEDURES - NORMAL ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL (25.0)

7.01 According to FP-203, what are the only two highly radioactive components that are allowed to be temporarily stored above the seal plate during fuel or core internals handling operations. (1.0)

7.02 According to OP-404, how do you assure that the DH system will not isolate on a spurious 284 psig signal during periods when the reactor vessel head is removed. Include physical and administrative controls. (2.0)

7.03 According to FP-302, what three checks must be made by a fire brigade member prior to removing the new fuel pit missle shield blocks. (1.5)

~~7.04~~ Deleted 04/ ~~FP-601 gives instructions on the rotation of fuel assemblies within the spent fuel pool. How is a 90° clockwise rotation accomplished. (1.0)~~

7.05 An actual plume release has occurred with a projected dose to the general population of 15 Rem whole body and 100 Rem thyroid. If the wind direction is constant from SSE to NNW, answer the following for the general population. (Protective Action Guidelines Table 7.051, Evacuation Time Estimate Table 7.052, and Wind Direction Data Table 7.053 are attached.)

a. Between 0 and five (5) miles, which sectors should evacuate. (0.5)

b. Between five (5) and ten (10) miles, which sectors should evacuate. (0.5)

c. Beyond ten (10) miles, which sectors should evacuate. (0.5)

d. How long will it take to evacuate handicapped, elderly and hospitalized individuals from within five (5) miles considering that normal conditions are present. (0.5)

7.06 a. List the Immediate Actions that are common (identical) for the four Runback APs:

Loss of Booster Pump	AP-540
Loss of Main Feed Pump;	AP-541
Asymmetric Rod	AP-542
Loss of One RCP	AP-543

(1.0)

b. List the additional Immediate Actions for AP-541 "Loss of Main Feed Pump Runback." (1.0)

c. Match the runback condition with the approximate power level at which you expect the plant to stabilize. (1.0)

i	Booster Pump	a.	75%
ii	Main Feed Pump	b.	70%
iii	Asymmetric Rod	c.	60%
iv	One RCP	d.	55%
		e.	50%

7.07 Fill in the following blanks with regard to containment access during Mode 1 operation.

a. Prior to any containment entry, personnel must obtain a ___(Form)___ and have it signed by ___(Title)___. (0.5)

b. Crew size will be a minimum of ___(number)___ personnel and the maximum time in the containment building will be limited to ___(time)___. (0.5)

c. In the event that there are any personnel in the containment building and the reactor trips ___(action to be taken)___. (0.5)

7.08 The first Immediate Action of AP-380, "Engineered Safeguards System Actuation," is to:

1. Verify valid actuation:
   - RC pressure <1500 psig
   - or
   - Manual actuation

What are the Remedial Actions associated with this step? (1.5)

7.09 Engineered Safeguards has actuated due to low RC pressure.

a. When are you required to stop the Reactor Coolant Pumps? (1.0)

b. Under what conditions (according to the Remedial Actions of AP-380) should the RCPs be kept running? (1.0)

7.10 OP 204, Power Operation, Section 2.0 states that "The expected various parametric system responses for reactor coolant (RC) and steam supply systems are given below. Also included are allowable deviations." Assuming that the reactor is at 50 percent power, what are the expected responses and allowable deviations for the following parameters?

a. RC pressure (.25)
b. RC temperature (average) (.25)
c. RC temperature (inlet) (.25)
d. RC temperature (outlet) (.25)
e. OTSG Outlet Pressure (.25)
f. OTSG Outlet Steam Temperature (.25)

7.11 Fill in the following as stated in OP-401, Core Flooding System.

a. CFV-5 and CFV-6 must be _____ and their breakers in the _____ position; breaker _____ when reactor coolant (RC) is greater than 750 psig. (.75)

b. CFV-5 and CFV-6 must be _____ and their breakers in the _____ position when RC pressure is less than 625 psig. (0.5)

c. Core Flood Tank (CFT), temperature must be above _____ °F before pressurizing the tanks. (.25)

7.12 TRUE or FALSE: An operator must be stationed at RCV-5 (pressurizer vent valve) to accomplish venting the pressurizer in accordance with OP 202, Plant Heatup. (0.5)

7.13 The Immediate Actions of AP-460," Steam Generator Isolation Actuation" call for the operator to ensure valves on affected OTSG(s) are closed and selected closed. Assume a steam line break on OTSG 'A'. List these required valves by name or number. (2.0)

7.14 An Immediate Action of AP-555, "Continuous Contro Rod Withdrawal" is the following:

3. Stop rod withdrawal:
   a. Transfer rod(s) to alternate power supply.

a. Assume the affected rod(s) are in Group 7. List the steps required to transfer the rod(s) to an alternate power supply. (2.0)

b. What are the Remedial Actions associated with Immediate Action (3) above? (1.0)

7.15 [MC] ICS procedure, OP-501 states in part, "If operating signal source malfunctions make signal source transfer necessary, transfer to another signal source should be done..."Which one of the following CORRECTLY completes this statement? Assume the ICS has not responded to the malfunctioning signal. (1.0)

a. immediately after placing the affected ICS station in HAND.

b. immediately, regardless of ICS operating mode.

c. only after checking the computer for a valid alternate signal and placing the affected ICS station in HAND.

d. only after checking the computer for a valid alternate signal; affected ICS station may be in HAND or AUTO.

END OF CATEGORY 7

CATEGORY 8 - ADMINISTRATIVE PROCEDURES, CONDITIONS AND LIMITATIONS (25.0)

8.01 [MC] The operational action limit placed on OTSG leakage is set such that there exists up to one week until the tube ruptures. Which of the following leak rates corresponds to that operational limit. (1.0)

a. 3.0 gpm
b. 1.0 gpm
c. 0.3 gpm
d. .03 gpm

8.02 While performing a valve lineup verification, a valve is discovered with a red tag in other than the required position. Should the verifier sign-off this valve with a note indicating that the valve position is controlled by a red tag? Explain your answer. (1.0)

8.03 What two conditions must be satisfied to use the PORV (RCV-10) manually to avoid high pressure reactor trips during emergency conditions? (2.0)

8.04 Can the designated "Operator at the Controls," in the event of an emergency affecting the safety of operations, momentarily assist an I&C technicians at the rear of the control room ICS panel if his actions are directly related to the emergency? Explain your answer. (1.0)

8.05 State the requirements for correcting an error in a shift log book. (1.0)

8.06 TRUE or FALSE:

a. Open annunciator links are recorded in the Equipment Out-of-Service Log (0.5)

b. ES systems which are logged in the Equipment Out-of-Service do not require independent verification of proper alignment per CP 115, In-Plant Clearance and Switching Orders, before returning the equipment to service. (0.5)

c. The Shift Supervisor can request the SOTA to escort an NRC inspector to Unit 5 so long as the SOTA can respond to the control room within 15 minutes. (0.5)

d. In the interim between reactor trip and approval for recovery, the Nuclear Shift Supervisor may authorize withdrawal of Safety Groups 1-4 provided a 1% delta K/K shutdown margin is maintained and rod withdrawal is not prohibited by any RPS "Action Statements" of Standard Technical Specifications. (0.5)

8.07 After using the PORV to prevent a reactor trip from 100 percent power on RCS pressure - high, indications lead you to suspect that the automatic reset of the PORV is out of calibration at 0200 hours. You request a calibration of the PORV lift setpoint and reset setpoints to verify PORV operability. The calibration procedure requires removing power to the PORV's solenoid valve which occurs at 0230 hours. Answer the following for this situation. (Technical Specifications are attached).

a. By what clock time must the block valve be closed to avoid being in Hot Standby within 6 hours? Explain your decision. (1.0)

b. Attempts to close the block valve at 0245 hours are unsuccessful. I&C technicians determine that the pressure bistable must be replaced which may take up to 8 hours. Since the PORV is already closed and power removed from the solenoid, can operation in Mode 1 continue? Explain. (1.0)

c. While in Hot Standby, the pressure bistable is replaced, thus returning the PORV to operability; however, the block valve remains inoperable in the open position. Can the unit return to power operations? Explain your answer. (1.0)

8.08 [MC] DG 'A' which supplies ES 4KV Bus 'A' is Inoperable. LPI pump 'A' supplied by ES 4KV Bus 'A' is inoperable. The Tech Spec for ECCS subsystems and AC sources are attached. Which statement is CORRECT concerning continued operation in Mode 1? (Technical Specifications are attached). (1.0)

a. The Action Statements for both the LPI pump and the DG are applied independently, each must be restored to OPERABLE in 72 hours.

b. Since the DG is required in Mode 4 and the LPI pump is not, the Unit must be taken to Mode 4 within 72 hours.

c. TS 3.0.3 applies; it requires action to place the unit in a mode in which the specification does not apply within 1 hour.

d. TS 3.0.5 applies; it requires action to place the unit in a mode in which the specification does not apply within 2 hours.

8.09 In the event that overtime must be used, the following overtime restrictions should be followed:

a. An individual should not be permitted to work more than _____ hours straight (not including shift turnover time). (0.5)

b. There should be a break of at least _____ hours (which can include shift turnover time) between all work periods. (0.5)

c. An individual should not work more than 72 hours in a _____ day period. (0.5)

d. An individual should not be required to work more than _____ consecutive days without having two consecutive days off. (0.5)

8.10 Answer the following concerning the Emergency Dose Assessment System.

a. What is the purpose of the Emergency Dose Assessment Assessment system? (1.0)

b. What two functions of the Emergency Dose Assessment system may operators be called upon to use? (1.0)

8.11 What are the three (3) categories of decisions that the Emergency Coordinator can not delegate the responsibility for? (1.5)

8.12 While in Mode 1, At 0500 hours, contract construction workers sever the power supply cables to the motor driven emergency feedwater pump. At 0800 hours, the turbine driven feedwater pump is rendered inoperable. If these events occurred on June 3, 1985, on what date and at what time must the unit be in Hot Standby should repair efforts not be completed on both pumps? (Consider Tech Spec requirements only). (Technical Specifications are attached). (1.0)

8.13 With one pressurizer code safety valve inoperable and the plant in Hot Standby, can the plant be taken to 4 percent power? Explain your answer. (Technical Specifications are attached). (1.0)

8.14 [MC] Technical Specifications on RCS Outlet Temperature - High reactor protection system instrumentation requires a monthly channel functional test. This test was performed at the following times: (1.0)

1. October 15 at 0400
2. November 19 at 0400
3. December 24 at 0400

Which of the following is the latest date that this test can be performed without declaring the instrument inoperable? (Technical Specifications are attached).

a. January 20th
b. January 23rd
c. January 26th
d. January 31st

8.15 Match the RCS leakage types in Column A to the Technical Specification limits in Column B (assume plant is in Mode 1). (Technical Specifications are attached). (1.0)

Column A		Column B	
a.	PORV seat leakage	1.	0 gpm
b.	OTSG tube leakage	2.	1 gpm
c.	Leakage from unknown location	3.	5 gpm
d.	Leakage from weld crack on the pressurizer surge line	4.	10 gpm
		5.	6 pgh

8.16 Consider the table concerning RCS leakage past CFV-1 during a reactor startup and answer the questions below. (Technical Specifications are attached).

Time	Power	CFV-1 Leakage
0100 hours	15%	0 gpm
0600 hours	50%	2 gpm
1800 hours	80%	No Measurement Made
2300 hours	100%	4 gpm

a. Do the Technical Specifications allow the unit to be at 80 percent power at 1800 hours? Explain your answer. (1.0)

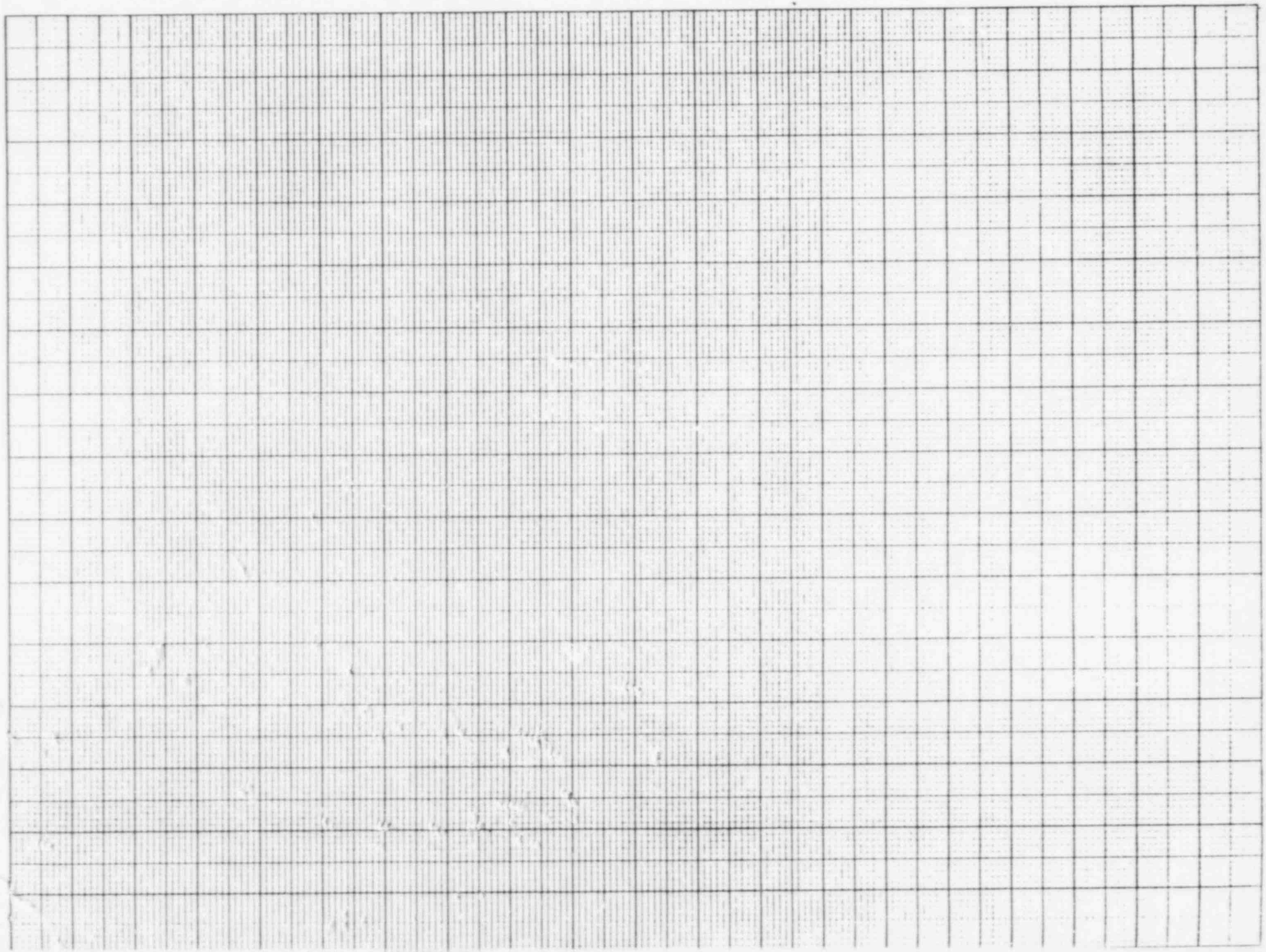
b. During shift turnover, at 2400 hours, you are handed the 4 gpm leakrate measurement. What actions are required by the Technical Specifications? (1.0)

8.17 Fill in the blanks. Each containment air lock shall be demonstrated operable within ____ hours after a single entry and at least once per ____ hours after multiple entries. (Technical Specifications are attached). ~~(1.0)~~ (0.5)

delete first blank

8.18 The reactor coolant average temperature was reduced to below 140°F with a reactivity condition of less than .95 Keff in preparation for personnel to make the initial containment entry to prepare for refueling. What mode is the plant in? (Technical Specifications are attached). (0.5)

END OF CATEGORY 8



EQUATION SHEET

Where $\dot{m}_1 = \dot{m}_2$

$(\text{density})_1(\text{velocity})_1(\text{area})_1 = (\text{density})_2(\text{velocity})_2(\text{area})_2$

$KE = \frac{mv^2}{2}$ $\quad PE = mgh$ $\quad PE_1+KE_1+P_1V_1 = PE_2+KE_2+P_2V_2$ $\quad$ where V = specific volume

P = Pressure

$Q = \dot{m}c_p(T_{out}-T_{in})$ $\quad Q = UA\,(T_{ave}-T_{stm})$ $\quad Q = \dot{m}(h_1-h_2)$

$P = P_{o}10^{sur(t)}$ $\quad P = P_{o}e^{t/T}$ $\quad SUR = \frac{26.06}{t}$

$\text{delta } K = (K_{eff}-1)/K_{eff}$ $\quad CR_1(1-K_{eff1}) = CR_2(1-K_{eff2})$

$M = \frac{(1-K_{eff1})}{(1-K_{eff2})}$ $\quad SDM = \frac{(1-K_{eff}) \times 100\%}{K_{eff}}$

$\text{decay constant} = \frac{\ln(2)}{t_{1/2}} = \frac{0.693}{t1/2}$ $\quad A = A_{oe}^{-(\text{decay constant})x(t)}$

Water Parameters

1 gallon = 8.345 lbs
1 gallon = 3.78 liters

1 ft^3 = 7.48 gallons

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 psia = 29.9 in Hg

Miscellaneous Conversions

1 Curie = 3.7×10^{10} dps
1 kg = 2.21 lbs

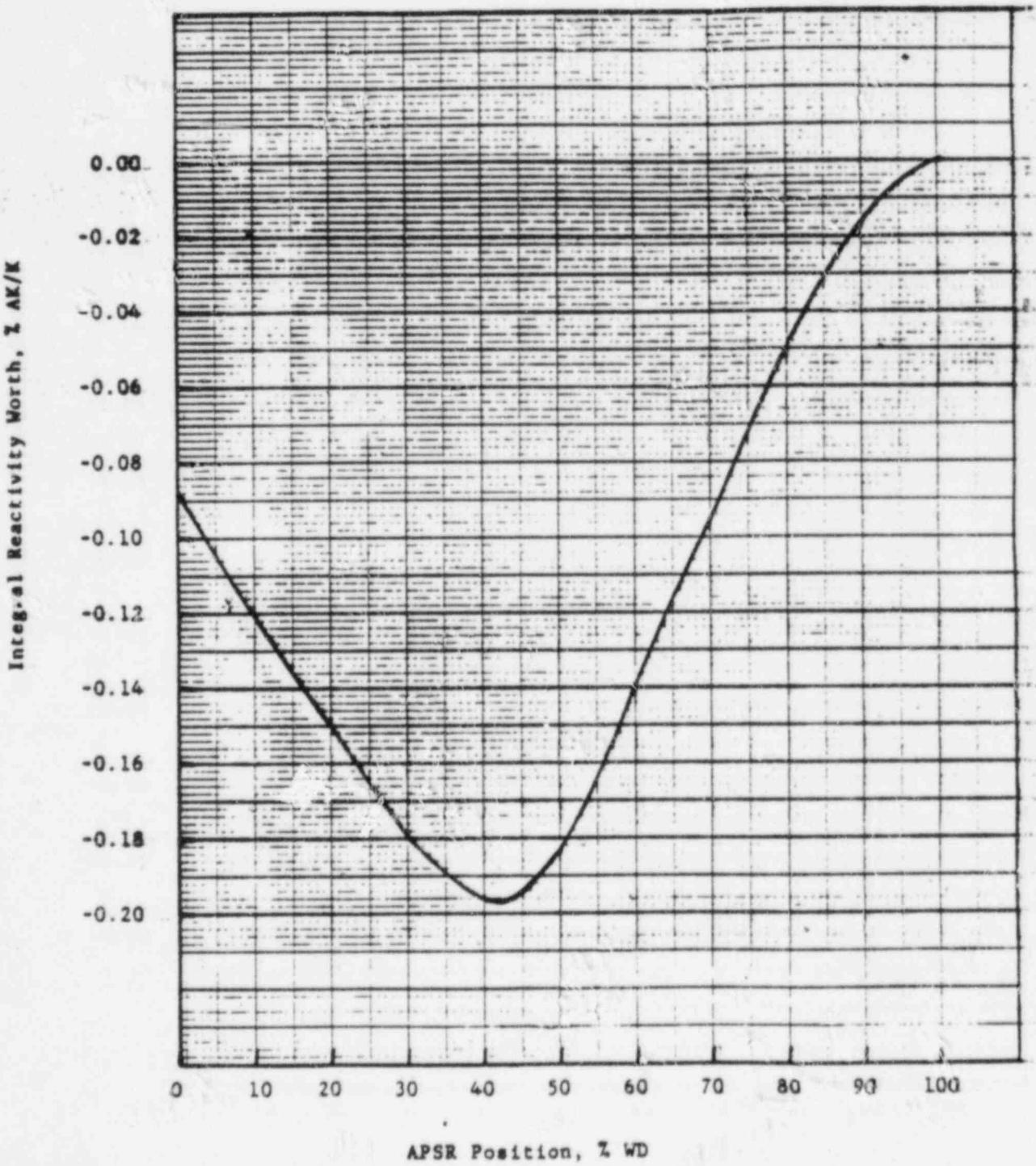
1 hp = 2.54×10^3 Btu/hr

1 Mw = 3.41×10^6 Btu/hr

1 inch = 2.54 centimeters
Degrees F = (1.8) x (Degrees C) + 32
1 Btu = 778 ft-lbf
g = 32.174 ft-lbm/lbf-sec^2

Curve 3.9

APSR Integral Reactivity Worth
0% FP, CRG 1-7 at 100% wd, No Xenon



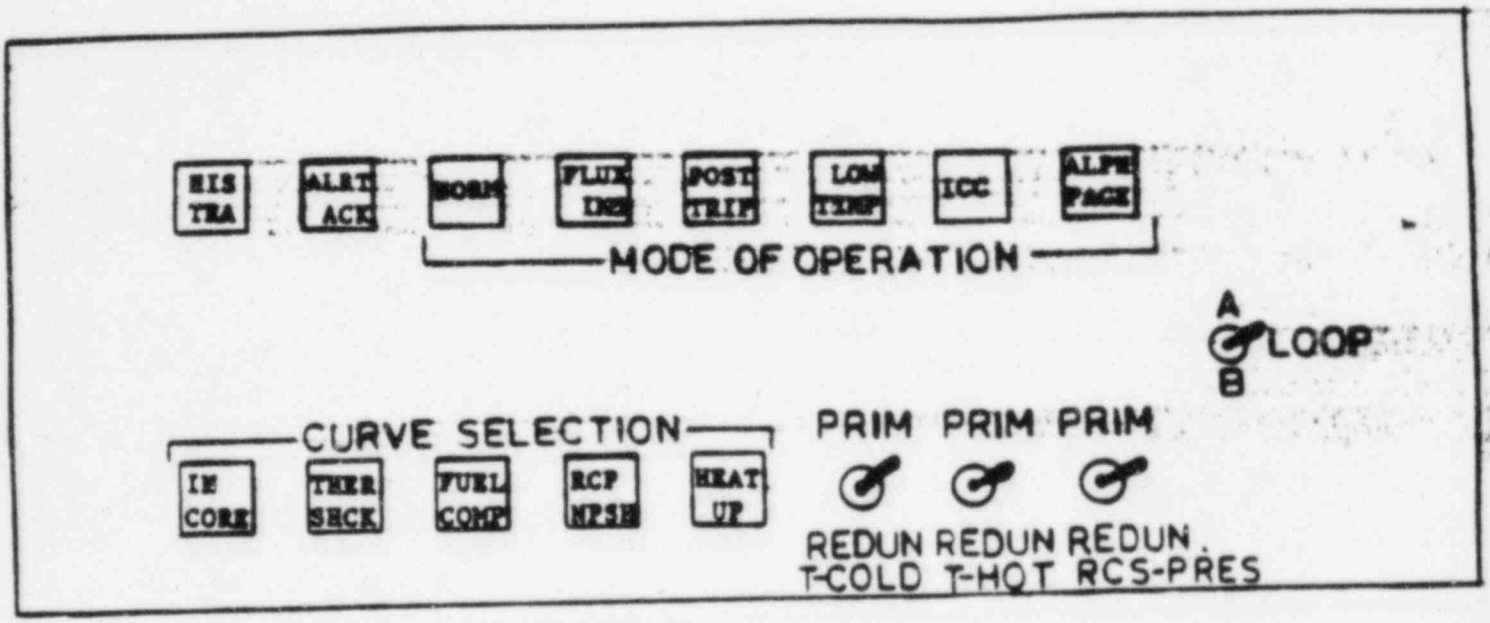


FIGURE 3

SPDS CONTROL PANEL

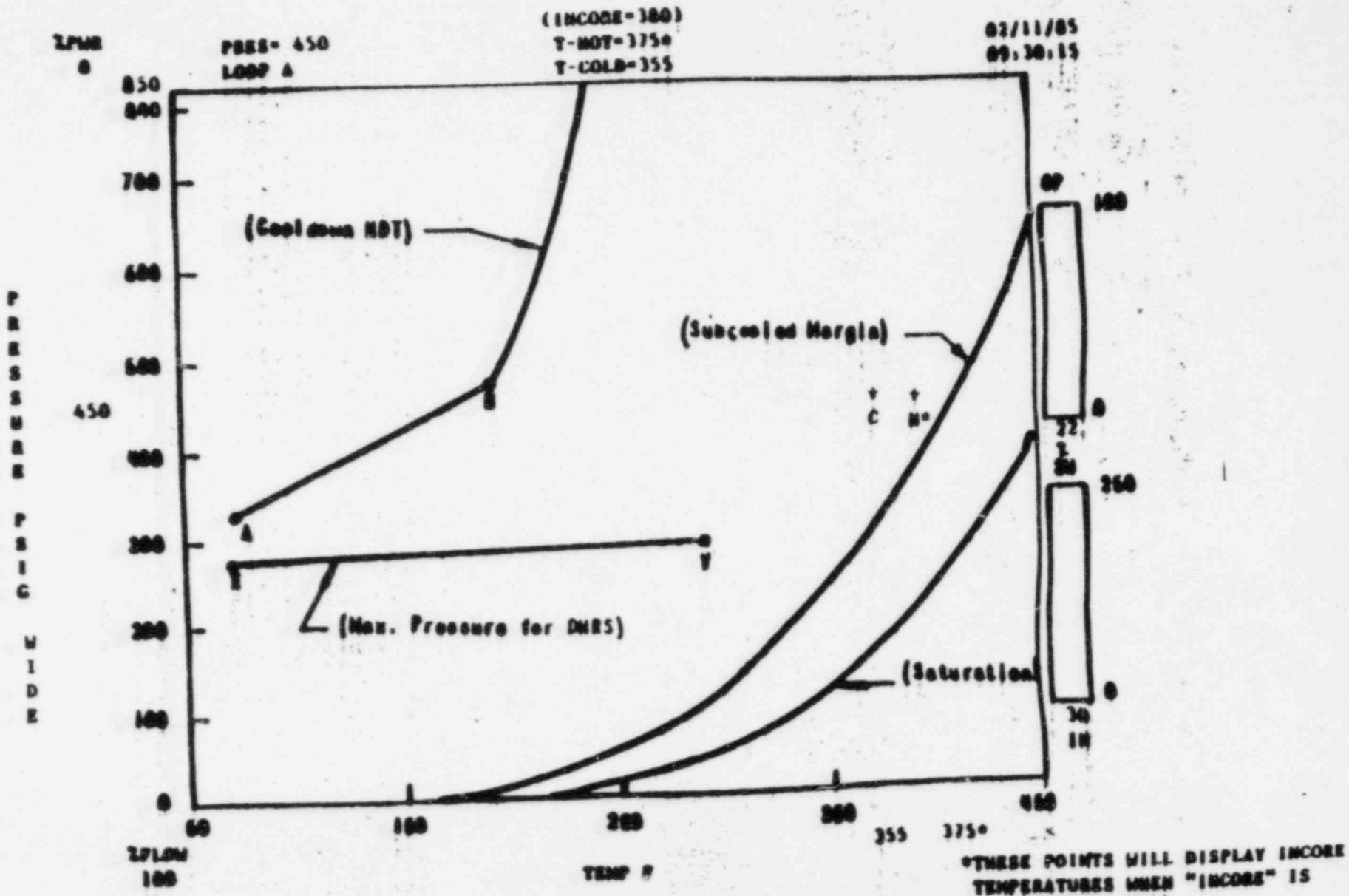


FIG. 5 LOW TEMP P-T DISPLAY

TABLE 7.051

GUIDELINES FOR RECOMMENDED PROTECTIVE ACTIONS FOR GASEOUS PLUME EXPOSURE*

NON-ESSENTIAL GENERATING COMPLEX PERSONNEL AND GENERAL POPULATION

CONDITION	RECOMMENDED ACTION
1. A General Emergency has been declared.	Two mile, 360°, precautionary evacuation. Five mile shelter of potentially effected sectors.**
2. A General Emergency has been declared. Substantial core damage in progress or projected. No containment failure has been projected. No substantial fission product inventory in containment.	Two mile, 360°, precautionary evacuation. Five mile evacuation of potentially effected sectors.**
3. A General Emergency has been declared. Substantial core damage in progress or projected. No containment failure has been projected. Fission product inventory in containment ≤ GAS GAP.	SAME AS ABOVE
4. A General Emergency has been declared. Substantial core damage in progress or projected. Containment failure and release likely but not imminent. Fission product inventory in containment > GAS GAP.	Five mile, 360°, evacuation. Ten mile evacuation of potentially effected sectors.**
5. A General Emergency has been declared. Substantial core damage in progress or projected. Containment failure is projected to be imminent. No substantial fission product inventory in containment.	Five mile, 360°, evacuation. Ten mile evacuation of potentially effected sectors.** Shelter areas which can not be evacuated before plume arrival.
6. A General Emergency has been declared. Substantial core damage in progress. Containment failure is projected to be imminent. Fission product inventory in containment > GAS GAP.	SAME AS ABOVE
7. An actual release has occurred or is in progress. Dose to the population is projected to be: a) Whole Body: >0.5 to ≤1.0 Rem b) Thyroid: >1.0 to ≤5.0 Rem	Two mile, 360°, shelter. Ten mile shelter of potentially effected sectors.**
8. An actual release has occurred or is in progress. Dose to the population is projected to be: a) Whole Body: >1.0 to ≤5.0 Rem b) Thyroid: >5.0 to ≤ 25 Rem	Two mile, 360°, evacuation. Ten mile evacuation of potentially effected sectors.** Ten mile shelter of remaining sectors.
9. An actual release has occurred or is in progress. Dose to the population is projected to be: a) Whole Body: >5.0 to ≤ 25 Rem b) Thyroid: > 25 to ≤ 125 Rem	Five mile, 360°, evacuation. Ten mile evacuation of potentially effected sectors.** Ten mile shelter of remaining sectors.
10. An actual release has occurred or is in progress. Dose to the population is projected to be: a) Whole Body: > 25 to < 75 Rem b) Thyroid: >125 Rem	Control exposure of emergency workers, except for lifesaving missions to 25 Rem Whole Body, 125 Rem Thyroid. (Appropriate controls for emergency workers include time limitations and respirators.)
11. An actual release has occurred or is in progress. Dose to the population is projected to be: a) Whole Body: ≥ 75 Rem	Control exposure of emergency workers performing lifesaving missions to 75 Rem whole Body. (Control of time exposure will be most effective.) NOTE: Although respirators should be used where effective to control dose to emergency workers, thyroid dose may not be a limiting factor for lifesaving missions.

*NOTE: References for this table are a combination of Table 5.1, page 5.31, Rev. 6/79 - Manual of Protective Actions for Nuclear Incidents and NUREG-0654, dated 1/80.

**Affected sectors include, as a minimum, the downwind sector(s) and adjacent sectors.

EVACUATION TIME ESTIMATE TABLES*

Distance (miles)	SECTORS A-D Hr.-Min.	E-H Hr.-Min.	J-M Hr.-Min.	N-R Hr.-Min.	ALL Hr.-Min.
GENERAL POPULATION (NORMAL CONDITIONS)					
0 - 2**	1 - 30	0 - 45	0 - 45	0 - 45	2 - 30
0 - 5	1 - 30	1 - 30	0 - 45**	0 - 45**	4 - 00
0 - 10	3 - 00	3 - 00	0 - 45**	0 - 45**	6 - 30
GENERAL POPULATION (ADVERSE CONDITIONS)					
0 - 2**	3 - 00	1 - 00	1 - 00	1 - 00	4 - 00
0 - 5	3 - 00	3 - 00	1 - 00**	1 - 00**	8 - 00
0 - 10	6 - 00	6 - 00	2 - 00**	2 - 00**	13 - 00
SPECIAL POPULATION (NORMAL CONDITIONS)***					
0 - 2**	N/A	N/A	N/A	N/A	N/A
0 - 5	2 - 00	2 - 00	N/A	N/A	5 - 00
0 - 10	3 - 00	3 - 00	N/A	N/A	6 - 30
SPECIAL POPULATION (ADVERSE CONDITIONS)***					
0 - 2**	N/A	N/A	N/A	N/A	N/A
0 - 5	4 - 00	4 - 00	N/A	N/A	N/A
0 - 10	6 - 00	6 - 00	N/A	N/A	13 - 00

*These are conservative estimates and are inclusive of warning times.

**These estimates are for personnel on FPC property. Evacuation time is based on a staged/sequenced generating complex evacuation via the plant access road.

***This category includes the handicapped, elderly, and hospitalized individuals and is inclusive of the general population.

TABLE 7.053

WIND DIRECTION DATA

	Wind From	Degrees	Wind Toward	Sectors Affected
[A]	N	349-11	S	H J K
[B]	NNE	12-33	SSW	J K L
[C]	NE	34-56	SW	K L M
[D]	ENE	57-78	WSW	L M N
[E]	E	79-101	W	M N P
[F]	ESE	102-123	WNW	N P Q
[G]	SE	124-146	NW	P Q R
[H]	SSE	147-168	NNW	Q R A
[J]	S	169-191	N	R A B
[K]	SSW	192-213	NNE	A B C
[L]	SW	214-236	NE	B C D
[M]	WSW	237-258	ENE	C D E
[N]	W	259-281	E	D E F
[P]	WNW	282-303	ESE	E F G
[Q]	NW	304-326	SE	F G H
[R]	NNW	327-348	SSE	G H J

TABLE 1.1

OPERATIONAL MODES

MODE	REACTIVITY CONDITION, K_{eff}	%RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1. POWER OPERATION	$\geq$ 0.99	> 5%	$\geq$ 280°F
2. STARTUP	$\geq$ 0.99	$\leq$ 5%	$\geq$ 280°F
3. HOT STANDBY	< 0.99	0	$\geq$ 280°F
4. HOT SHUTDOWN	< 0.99	0	280°F > T_{avg} > 200°F
5. COLD SHUTDOWN	< 0.99	0	$\leq$ 200°F
6. REFUELING**	$\leq$ 0.95	0	$\leq$ 140°F

*Excluding decay heat.

**Reactor vessel head unbolted or removed and fuel in the vessel.

3/4 LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

3/4.0 APPLICABILITY

LIMITING CONDITION FOR OPERATION

3.0.1 Limiting Conditions for Operation and ACTION requirements shall be applicable during the OPERATIONAL MODES or other conditions specified for each specification.

3.0.2 Adherence to the requirements of the Limiting Condition for Operation and/or associated ACTION within the specified time interval shall constitute compliance with the specification. In the event the Limiting Condition for Operation is restored prior to expiration of the specified time interval, completion of the ACTION statement is not required.

3.0.3 When a Limiting Condition for Operation is not met, except as provided in the associated ACTION requirements, within 1 hour action shall be initiated to place the unit in a MODE in which the Specification does not apply by placing it, as applicable, in:

1. At least HOT STANDBY within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

Where corrective measures are completed that permit operation under the ACTION requirements, the ACTION may be taken in accordance with the specified time limits as measured from the time of failure to meet the Limiting Condition for Operation. Exceptions to these requirements are stated in the individual Specifications.

3.0.4 Entry into an OPERATIONAL MODE or other specified applicability condition shall not be made unless the conditions of the Limiting Condition for Operation are met without reliance on provisions contained in the ACTION statements unless otherwise excepted. This provision shall not prevent passage through OPERATIONAL MODES as required to comply with ACTION statements.

3.0.5 When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered OPERABLE for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation, provided: (1) its corresponding normal or emergency power source is OPERABLE; and (2) all of its redundant system(s), sybsystem(s), train(s), component(s) and device(s) are OPERABLE, or likewise satisfy the requirements of this specification. Unless both conditions (1) and (2) are satisfied, within 2 hours action shall be initiated to place the unit in a MODE in which the applicable Limiting Condition for Operation does not apply by placing it as applicable in:

1. At least HOT STANDBY within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

This Specification is not applicable in MODES 5 or 6.

APPLICABILITY

SURVEILLANCE REQUIREMENTS

4.0.1 Surveillance Requirements shall be applicable during the OPERATIONAL MODES or other conditions specified for individual Limiting Conditions for Operation unless otherwise stated in an individual Surveillance Requirement.

4.0.2 Each Surveillance Requirement shall be performed within the specified time interval with:

a. A maximum alloweble extension not to exceed 25% of the surveillance interval, and

b. A total maximum combined interval time for any 3 consecutive tests not to exceed 3.25 times the specified surveillance interval.

4.0.3 Performance of a Surveillance Requirement within the specified time interval shall constitute compliance with OPERABILITY requirements for a Limiting Condition for Operation and associated Action statements unless otherwise required by the specification. Surveillance Requirements do not have to be performed on inoperable equipment.

4.0.4 Entry into an OPERATIONAL MODE or other specified applicability conditions shall not be made unless the Surveillance Requirement(s) associated with the Limiting Condition for Operation has been performed within the stated surveillance interval or as otherwise specified.

4.0.5 Surveillance Requirements for inservice inspection and testing of ASME Code Class 1, 2, and 3 components shall be applicable as follows:

a. For the time period from issuance of the Facility Operating License to the start of facility commercial operation, inservice testing of ASME Code Class 1, 2, and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code 1974 Edition, and Addenda through Summer 1975, except where specific written relief has been granted by the Commission.

b. For the time period following start of facility commercial operation, inservice inspection of ASME Code Class 1, 2, and 3 components and inservice testing of ASME Code Class 1, 2, and 3 pumps and valves shall be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50, Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50, Section 50.55a(g)(6)(i).

APPLICABILITY

SURVEILLANCE REQUIREMENTS (Continued)

Performance of the above inservice inspection and testing activities shall be in addition to other specified Surveillance Requirements. The provisions of Specification 4.0.2 are not applicable to surveillance intervals associated with inservice inspection and testing activities required by Section XI of the above ASME Boiler and Pressure Vessel Code and applicable Addenda.

REACTOR COOLANT SYSTEM

RELIEF VALVES - OPERATING

CODE SAFETY VALVES

LIMITING CONDITION FOR OPERATION

3.4.3.1 All pressurizer code safety valves shall be OPERABLE with a lift setting of 2500 psig ± 1%.

APPLICABILITY: MODES 1, 2, and 3.

ACTION:

With one pressurizer code safety valve inoperable, either restore the inoperable valve to OPERABLE status within 15 minutes or be in HOT SHUTDOWN within 12 hours.

SURVEILLANCE REQUIREMENTS

4.4.3.1 No additional Surveillance Requirements other than those required by Specification 4.0.5.

REACTOR COOLANT SYSTEM

POWER OPERATED RELIEF VALVES

LIMITING CONDITION FOR OPERATION

3.4.3.2 The power operated relief valve (PORV) and its associated block valve shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTION:

a. With the PORV inoperable, within 1 hour either restore the PORV to OPERABLE status or close the associated block valve and remove power from the block valve; otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With the block valve inoperable, within 1 hour either restore the block valve to OPERABLE status or close the block valve and remove power from the block valve or close the PORV and remove power from the associated solenoid valve; otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.4.3.2.1 In addition to the requirements of Specifications 4.0.5, the PORV shall be demonstrated OPERABLE at least once per 18 months by performance of a CHANNEL CALIBRATION.

4.4.3.2.2 The block valve shall be demonstrated OPERABLE at least once per 92 days by operating the valve through one complete cycle of full travel.

OPERATIONAL LEAKAGE

LIMITING CONDITION FOR OPERATION

3.4.6.2 Reactor Coolant System leakage shall be limited to:

a. No PRESSURE BOUNDARY LEAKAGE.

b. 1 GPM UNIDENTIFIED LEAKAGE.

c. 1 GPM total primary-to-secondary leakage through steam generators.

d. 10 GPM IDENTIFIED LEAKAGE from the Reactor Coolant System,

e. 10 GPM CONTROLLED LEAKAGE at a Reactor Coolant System pressure of 2150 ± 20 psig, and

f. Leakage as specified in Table 3.4-2 for those Reactor Coolant System Pressure Isolation Valves identified in Table 3.4-2.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With any PRESSURE BOUNDARY LEAKAGE, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With any Reactor Coolant System leakage greater than any one of the above limits, excluding PRESSURE BOUNDARY LEAKAGE, reduce the leakage rate to within limits within 4 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With any Reactor Coolant System Pressure Isolation Valve leakage greater than the above limit, reactor operation may continue provided that at least two valves in each high pressure line having a non-functional valve are in, and remain in, the mode corresponding to the isolated condition. (Motor operated valves shall be placed in the closed position and power supplies deenergized.)

d. The provisions of Section 3.0.4 are not applicable for entry into MODES 3 and 4 for the purpose of testing the isolation check valves.

SURVEILLANCE REQUIREMENTS

4.4.6.2.1 Reactor Coolant System leakages shall be demonstrated to be within each of the above limits by:

a. Monitoring the containment atmosphere iodine radioactivity monitor at least once per 12 hours,

b. Monitoring the containment sump inventory and discharge at least once per 12 hours,

c. Measurement of the CONTROLLED LEAKAGE from the reactor coolant pump seals when the Reactor Coolant System pressure is 2150 ± 20 psig at least once per 31 days,

d. Performance of a Reactor Coolant System water inventory balance at least once per 72 hours during steady state operation.

4.4.6.2.2 Each Reactor Coolant System Pressure Isolation Valve specified in Table 3.4-2 shall be individually demonstrated OPERABLE prior to entering MODE 2 by verifying leakage to be within its limit:

a. After each refueling outage,

b. Whenever the plant has been in COLD SHUTDOWN for 72 hours, or more, if leakage testing has not been performed in the previous 9 months, and

c. Prior to returning the valve to service following maintenance, repair or replacement work on the valve.

4.4.6.2.3 Whenever integrity of a pressure isolation valve listed in Table 3.4-2 cannot be demonstrated, the integrity of the remaining valve in each high pressure line having a leaking valve shall be determined and recorded daily. In addition, the position of the other closed valve located in the high pressure piping shall be recorded daily.

TABLE 3.4-2

REACTOR COOLANT SYSTEM PRESSURE ISOLATION VALVES

System	Valve	Maximum Allowable Leakage(a)(b)(c)
Decay Heat/Low Pressure Injection	CFV-1	< 5.0 gpm
	DHV-2	< 5.0 gpm
	CFV-3	< 5.0 gpm
	DHV-1	< 5.0 gpm

Notes:

(a) Maximum Allowable Leakage (each valve):

1. Leakage rates less than or equal to 1.0 gpm are considered acceptable.

2. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered acceptable if the latest measured rate has not exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

3. Leakage rates greater than 1.0 gpm but less than or equal to 5.0 gpm are considered unacceptable if the latest measured rate exceeded the rate determined by the previous test by an amount that reduces the margin between measured leakage rate and the maximum permissible rate of 5.0 gpm by 50% or greater.

4. Leakage rates greater than 5.0 gpm are considered unacceptable.

(b) To satisfy ALARA requirements, leakage may be measured indirectly (as from the performance of pressure indicators) if accomplished in accordance with approved procedures and supported by computations showing that the method is capable of demonstrating valve compliance with the leakage criteria.

(c) Minimum differential test pressure shall not be less than 150 psid.

EMERGENCY CORE COOLING SYSTEMS

ECCS SUBSYSTEMS - T_{avg} > 280°F

LIMITING CONDITION FOR OPERATION

3.5.2 Two independent ECCS subsystems shall be OPERABLE with each subsystem comprised of:

a. One OPERABLE high pressure injection (HPI) pump.

b. One OPERABLE low pressure injection (LPI) pump.

c. One OPERABLE decay heat cooler, and

d. An OPERABLE flow path capable of taking suction from the borated water storage tank (BWST) on a safety injection signal and manually transferring suction to the containment sump during the recirculation phase of operation.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

a. With one ECCS subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.

b. In the event the ECCS is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date.

CONTAINMENT AIR LOCKS

LIMITING CONDITION FOR OPERATION

3.6.1.3 Each containment air lock shall be OPERABLE with:

a. Both doors closed except when the air lock is being used for normal transit entry and exit through the containment, then at least one air lock door shall be closed, and

b. An overall air lock leakage rate of $\leq 0.05\ L_a$ at P_a, 49.6 psig.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With an air lock inoperable, restore the air lock to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.1.3 Each containment air lock shall be demonstrated OPERABLE:

a.* After each opening, except when the air lock is being used for multiple entries, then at least once per 72 hours, by verifying seal leakage $\leq 0.01\ L_a$ when the volume between the door seals is pressurized to ≥ 8 psig, for at least 30 seconds.

b. At least once per 6 months by conducting an overall air lock leakage test at P_a, 49.6 psig, and by verifying that the overall air lock leakage rate is within its limit, and

c. At least once per 6 months by verifying that only one door in each air lock can be opened at a time.

*Exemption to Appendix "J" of 10 CFR 50.

PLANT SYSTEMS

EMERGENCY FEEDWATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 Two independent steam generator emergency feedwater pumps and associated flow paths shall be OPERABLE with:

a. One emergency feedwater pump capable of being powered from an OPERABLE emergency bus, and

b. One emergency feedwater pump capable of being powered from an OPERABLE steam supply system.

APPLICABILITY: MODES 1, 2, and 3.

ACTION:

a. With one emergency feedwater pump and/or associated flow path inoperable, restore the inoperable system to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.7.1.2 Each emergency feedwater system shall be demonstrated OPERABLE:

a. At least once per 31 days by:

1. Verifying that the steam turbine driven pump develops a discharge pressure greater than or equal to 1100 psig on recirculation flow when the secondary steam supply pressure is greater than 200 psig.*

2. Verifying that the motor driven pump develops a discharge pressure of greater than or equal to 1100 psig on recirculation flow.

* When not in MODES 1, 2, or 3, surveillance shall be performed within 24 hours after entering MODE 3 and prior to entering MODE 2.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Two separate and independent diesel generators each with:

1. A separate day fuel tank containing a minimum volume of 400 gallons of fuel,

2. A separate fuel storage system containing a minimum volume of 20,300 gallons of fuel, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With either an offsite circuit or diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a and 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter; restore at least two offsite circuits and two diesel generators to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one offsite circuit and one diesel generator of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a and 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter; restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two offsite circuits and two diesel generators to OPERABL status within 72 hours from the time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

ACTION (Continued)

c. With two of the above required offsite A.C. circuits inoperable, demonstrate the OPERABILITY of two diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 within one hour and at least once per 8 hours thereafter, unless the diesel generators are already operating; restore at least one of the inoperable offsite sources to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours. With only one offsite source restored, restore at least two offsite circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

d. With two of the above required diesel generators inoperable, demonstrate the OPERABILITY of two offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within one hour and at least once per 8 hours thereafter; restore at least one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore at least two diesel generators to OPERABLE status within 72 hours from time of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.1.1.1 Each independent circuit between the offsite transmission network and the onsite Class 1E distribution system shall be:

a. Determined OPERABLE at least once per 7 days by verifying;

1. Correct breaker alignments and indicated power availability, and

2. That the sump pumps in the tunnel containing the DC control feeds to the 230kv switchgear are OPERABLE.

b. Demonstrated OPERABLE at least once per 18 months during shutdown by transferring unit power supply from the normal circuit to the alternate circuit.

CATEGORY 5 - ANSWERS

5.01
a. Increase (0.5)
b. Decrease (0.5)
c. Increase (0.5)
d. No effect (0.5)
Ref: CR3 HTFF, pg 158 & 159

5.02
a. Higher (more Xenon) (0.5)
b. Lower (less negative than used in calc.) (0.5)
c. Higher (Tave increases, more neg. reactivity) (0.5)
d. No change (no effect on Tave) (0.5)
Ref: NUS Manual 3, Section 12.5

5.03
To prevent steam bubble formation in reactor vessel head (BW)
~~To prevent rapid and erratic changes in pressurizer~~ (1.0)
~~level from occurring due to bubble formation in the~~
~~vessel head.~~
Ref: HTFF, CR-3 Draft Manual

5.04
a. Inserted (0.5)
b. Inserted (0.5)
Ref: APSR Integral worth curve at 0% FP, ARO

5.05
a. Pressure boundary (0.5)
b. DNBR (0.5)
c. DNBR (0.5)
d. DNBR (0.5)
Ref: T.S. 2.1, Safety limits bases

5.06
a. Increase (0.5)
b. Decrease (0.5)
c. Increase (0.5)
d. Increase (0.5)
Ref: NUS Module 3, Section 8.4

5.07
a. More (0.5)
b. Less (0.5)
Ref: NRC B&W System Manual, p. 8.1-8

delete B&W
~~5.08 Answer (d)~~ ~~(1.0)~~

Ref: HTFF, B3.3, p 355

5.09
Answer (a) False TS 3/4 2-5 & 2-7 (0.5)
(b) ~~False~~ TS 3/4 2-11 TRUE BW (0.5)
(c) True TS 3/4 B2-1 (0.5)

5.10 Answer (c) (1.0)

Ref: ICS Analog & Digitals

5.11 Answer True (0.5)

Ref: HTFF p. I51

5.12 Answer (a) True p. 10 (0.5)
(b) True p. 2
(c) True pp 2-3
(d) False p. 7

Ref: Analysis Summary in Support of an Early RC Pump Trip B&W Submittal - August 24, 1979

5.13 Answer: Based on the maximum time within which a trip must occur to provide DNBR protection for the four pump coastdown (1.0)

Ref: TS p. B2-7

5.14 Answer (a) DECREASE (0.5)
(b) NOT CHANGE (0.5)
(c) DECREASE (0.5)
(d) ~~DECREASE~~ INCREASE BW (0.5)

Ref: HTFF, Section 2, p. 57

5.15 Answer: 1. Zirc-water and metal water reaction (0.5)
($Zr + 2H_2O \rightarrow ZrO_2 + 2H_2$)

2. Dissolved H_2 (0.5)
(will come out during depressurization)

3. Radiolytic decomposition of water (0.5)
($2H_2O \rightarrow 2H_2 + O_2$)

4. Aluminum plus Sodium Hydroxide water solution (0.5)
($2Al + 2NaOH + 2H_2O \rightarrow 2NaAlO_2 - 3H_2$)

Ref: HTFF, Section of Reactor Heat Transfer and Thermal Hydraulics

5.16 Answer b. CR1/CR2 = 1-k2/1-k1 for a tripled count rate (1.0)

and a Keff=.95

K2 = 1 - .01665 = .98335

.0335/.05 = .67 - 2/3

Ref: NUS, Vol. 3, pp 12.1-4

5.17 Answer d for 0-5 assemblies, 1/M = .571 (1.0)
for 0-10 assemblies, 1/M = .444
for 0-15 assemblies, 1/M = .348
for 10-15 assemblies, 1/M = .782

See attached graph for curves

Ref: NUS, Vol. 3, Units 12.2, 12.3.

5.18 Answer d (1.0)

Ref: NUS, Vol. 3, Units 9.4, 9.5

CATEGORY 6 - ANSWERS

6.01 Answer: (1) Grapple unloaded core (2.0)

(a) Grapple disengaged
(b) Grapple over core
(c) Grapple elevation less than 125 feet

(2) Grapple Loaded Core

(a) Grapple engaged
(b) Grapple over core
(c) Grapple elevation less than 139 feet

(3) Transfer Area

(a) any time grapple is over racks.

Ref: STM 21-48 Also, see Tables 3-3, 3-4 and 3-5 (Rev)

6.02 Answer: (1) the fuel grapple must be up (0.5)

(2) the TV cylinder must be up or bypassed (0.5)

(3) the control rod tube must be up (0.5)

(4) the control rod mast must be in the orifice retracted position or the telescopic cylinder must be fully up (0.5)

Ref: STM 21-39

6.03 2 - are located on the Remote Shutdown Panel - 2nd floor of Control Complex outside of 'B' 4kv Switch Gear Room (0.5)

1 - inside 'A' 4kv ES Switch Gear Room (0.25)
1 - inside 'B' 4kv ES Switch Gear Room (0.25)

Ref: Remote Shutdown Panel, MAR Training, 77-07-01, pg 1

6.04 Answer: a. low exhaust hood temperature (1.0)

Ref: STM 27-72

6.05 Answer: (1) (closes WDV 439)
(waste gas discharge auto control valve) (0.5)

(2) (closes WDV 393, 394 and 395)
(waste gas decay tank outlet to recycle valves) (0.5)

Ref: STM 41-4

6.06 Answer: a. Modulating solenoid valves that use an increasing DC current opposing spring pressure. (0.5)

b. Fail in full open position on a loss of power. (0.5)

c. No provisions for any local or manual control. (0.5)

Ref: Lesson: EFW and EFIC; ANO-113, p. 8 & 9

6.07 Answer: EFV-1 and EFV-2 are interlocked such that they can be open only if at least one of the two DC powered condenser vacuum breakers is open. (1.0)

Ref: Lesson: Emergency Feedwater and EFIC, ANO-113, pg 2

6.08 Answer: (1) after 150 minutes idle time (0.5)
(2) after 25 minutes running time (0.5)

Ref: STM 2-105

6.09 Answer: 15 hours (0.5)

Ref: OP 404, step 4.2

6.10 MCC 3A3
119' Elev (Aux Bldg) in Corridor near MCC 3A2 - Directly East of Spent Fuel Pools (0.5)

MCC 3B3
95' Elev (Aux Bldg) Outside MUP area (0.5)

Ref: Lesson No. MAR 80-05-14-03

6.11 1. 50 psig (0.5)
2. 125 psig (0.5)
3. 50 psig (0.5)
4. 0 psig ~~or~~ 50 psig (0.5)

Ref: STM CH 504, pg 49 & 50

6.12 a. No runback. (0.5) Load limit for 3-RCP's is 75% (page 12) (0.5)

b. FW will reratio. (0.5) Total FW demand signal is modified by delta between Loop A and Loop B RCS flow (see diagram page 72) (0.5)

Ref: STM CH 504, pages noted above.

6.13 a. 1. HPI Block 3 and Block 5 actuated on 2 out of 3 channels (RC-1, RC-2, RC-3) or (0.5)
2. HPI bypassed after an actuation on 2 out of 3 channels (RC-1, RC-2, RC-3) (0.5)

b. 30 psig signal [2 of 3 channels RB-4, RB-5, RB-6] (0.5)

c. 1. 2 new reset pushbuttons on ESF-A&B sections of main control board (0.5)
2. If HPI is bypassed and the associated ES 4160V bus UV relays actuate, the permit will be automatically reset. (0.5)
3. If HPI is bypassed and is then reactuated by either LPI or RB ISO and COOLING, the permit will automatically be reset. (0.5)

Ref: MAR TRAINING, #82-05-01-01, ES LOGIC MODIFICATION, pg 2 & 3

6.14 a. Ensures that the TBV's remain closed on a loss of power. (1.0)

b. On loss of CW pumps or low vacuum, the ICS will close the TBV's. (Circuitry in the ICS that shifted header pressure control to ADV's [for loss of CW pumps and low vacuum] has been removed.) (1.0)

Ref: Lesson No. 77-07-01-11

6.15 a. Reactor power must be >20% for auto initiation on loss of both main FW pumps (pg. 14) (0.5)

b. 1 of 2 Taken Twice logic - Only one bus relays are energized (pg 13 - Fig. 5A) (0.5)

delete per c. EFIC is manually bypassed (loss of all RCP initiation) when reactor power is <18%. (pg 14) ~~(0.5)~~

d. Initiation of EFW requires HPI actuation of Both A & B ESAS channels. (pg 14) (0.5)

Ref: ANO-113 Emergency FW & EFIC pp-noted above.

6.16 a. Highest of 4 Power Range NI's (0.5)
b. Average of 5 highest incore readings (12 incore inputs into SPDS) (0.5)
c. Source Range count rate >1000 cps, after 25 min per and all rods are NOT in 3 sec after Trip (.25) (.25)
d. The SPDS display will automatically switch to the Post-Trip Screen (.25)
with the history trace on (.25)

Ref: MAR Training, SPDS

CATEGORY 7 - ANSWERS

7.01 **Answer:** LBPR Retainer BW (0.5)
Source Retainer (0.5)

Ref: FP-203, Step 5.1.10

7.02 Answer: Valve breaker handle place in "Lock-Reset" position

(DHV-3) DH Removal Outlet (0.5)
(DHV-4) DH Removal Isolation (0.5)
(DHV-41) DH Removal Outlet Containment Isolation (0.5)

Controlled by the S.S. and are blue tagged (0.5)

Ref: OP-404, Section 4.10

7.03 Answer: (1) Valve to Fire hose station adjacent to pit is closed (0.5)

(2) Nozzle on hose is closed (0.5)

(3) No foaming attachments are present (0.5)

Ref: FP-302, Rev. 18, Step 4.25

~~7.04~~ deleted OPI

~~(1) Raise to "Grapple Tube Up" position (.20)~~
~~(2) Verify "full up" on ZZ Tape (.20)~~
~~(3) Pull out spring loaded lock pin (.20)~~
~~(4) Use ratchet handle to rotate 90° (.20)~~
~~(5) Release locking pin (.20)~~

Ref: FP-601, Rev. 18, Step 9.8

7.05 Answer: a. ALL (0.5)

b. [Q] [R] [A] (0.5)

c. None (0.5)

d. 5 hours (0.5)

Ref: EM-203, Rev. 14, pp 4 & 5
EM-207, Rev. 18, pp 15

7.06 a. 1. Ensure turbine runback
2. Ensure RC stable (1.0)

NOTE: All but AP-542 say "Ensure control rods inserting", AP-542 says "Ensure NI power lowering."

b. Ensure: (1) affected MFP tripped
(2) OPEN - FWV-28 (cross-tie)
(3) CLOSED - FWV-29 and FWV-30
(4) control rods inserting (1.0)

c. i - 55% - d
ii - 55% - d
iii - 60% - c
iv - 70% - b (1.0)

7.07 a. Radiation Work Permit (.25)
Shift Supervisor (.25)

b. 2 (.25)
1 hr (.25)

c. Sound containment evacuation alarm. (0.5)

Ref: OP-417, Rev. 38 pgs 4 and 36

7.08 1. Bypass ES Actuation (0.5)
2. Return ES Equipment to Standby status (0.5)
3. Go to VP-580 (0.5)

Ref: AP-380, Rev. 04, pg. 3.

7.09 a. If subcooling margin is inadequate (1.0)
> 1500 psig 20°F
≤ 1500 psig 50°F

b. If all RCPs have not been stopped within two minutes, they must be kept running (1.0)

Ref: AP-380, Rev. 04, pg. 4.

7.10 Answer:
a. 2155 ± 100 psig (.25)
b. 579 ± 3.5°F (.25)
c. 568 ± 3.5°F (.25)
d. 590 ± 3.5°F (.25)
e. ~~891 ± 9 psig~~ 900 ± 10 psig (885 psia) (.25)
f. 588 ± 5°F (.25)

Ref: OP-204, Section 2.0

Allowance of ±2°F or ±2psig on setpoint and ±1°F or ±1 psig on tolerance.

7.11 a. Open, Locked Reset, Locked (.75)
b. Closed, Locked Reset, (0.5)
c. 69 (.25)

Ref: OP-401

7.12 Answer: True (0.5)

Ref: OP-202, Step 6.3.2

7.13 OTSG A

MSV-411 & 412 (MSIVs)
FWV-30 (MBV)
FWV-31 (LLBV)
FWV-36 (SUBV)
FWV-28 (Cross-tie)
FWV-14 (FWP Suction)
FWV-35 (EBV)
~~NOTE: Step 3 - MSV-55~~
NOTE: Step 4 - Ensure Closed
MSV-9 & 10 (TBVs)
MSV-25 (ADV)

(0.2 ea)

Ref: AP-460, Rev. 02, pg. 2

7.14 NOTE: OP-502 Step 12.1 says to refer to Section 7.1. This section addresses Safety Group Transfer from DC Hold to Auxiliary.

(2.0)

a. Select: All (Optional) (0)
Select: Manual (.2)
Select: SEQ-OR (.2)
Select: Aux (.2)
Select: Group desired (.2)
Depress Transfer Reset (.2)
Select: Jog (.2)
Select: Clamp (.2)
Press: Manual Transfer (.2)
Press: Clamp Rel (.2)
Press: Group (.2)
Select: Run, if desired (0)

1. Select MANUAL
Select ROD GROUP
Select ALL (optional)
Select AUX
Select SEQ-OR
Select JOG
2 Verify SYNC
3 Select CLAMP
4 Select MANUAL TRANSFER
5 Select CLAMP RELEASE
6 Select GROUP
7 Select RUN (if desired)

Ref: OP-502, Rev. 17, Step 7.1.1 through 7.1.10

b. Trip Reactor AND (.5)
go to AP-580 (.5)

7.15 Answer: b

Ref: OP-501, Rev. 8, pg. 3.

CATEGORY 8 - ANSWERS

8.1 Answer: c. (1.0)

Ref: OSIM VI-4

8.2 Answer: No. OSIM Policy (Step B.1) does not permit sign-off for a red-tagged item in other than the specified condition. (1.0)

Ref: OSIM VI-1

8.3 Answer: (1) Block valve (RCV-11) must be operable (1.0)
(2) Must have a dedicated operator (1.0)

Ref: OSIM V-22

8.4 Answer: No. He must remain within visual contact of control board unless relieved. (1.0)

Ref: OSIM-I

8.5 Answer: (1) Single line thru incorrect entry (.33)

(2) Enter correct information adjacent to or in a space available with reference to deleted entry (.33)

(3) Individual making correction shall initial and date error correction (.33)

8.6 Answer:
a. True (0.5)
b. False (independent verification required) (0.5)
c. False (10 minutes) (0.5)
d. False (only safety group 1) (0.5)

Ref: OSIM III-9, III-10 and IV-2

8.7 Answer:
a. (1) If the S.S. declares the PORV inoperable @0200 then 0300 (1.0)

(2) If the S.S. does not declare PORV inoperable @0200 then 0330

b. (1) Hot standby within 7 hours from time stated in part a. (1.0)

c. Yes. Provisions of 3.04 are not applicable. (1.0)

Ref: TS 3.4.3.2

8.8 Answer: a. (1.0)

Ref: Enclosed TS

8.9 Answer: a. 12
b. 12
c. 7
d. 14

(0.5 each)

Ref: OSIM III-5

8.10 a. To predict the trajectories and dose rates of radioactive material released from the plant. (1.0)

b. (1) F1 - Emerge/Accident Control (0.5)
(2) F4 - Dose Assessment (0.5)

8.11 (1) Emergency Classification (0.5)

(2) Notification (0.5)

(3) Protective Action recommendations to State and local authorities responsible for offsite emergency measures (0.5)

Ref: EM 202, Rev. 21, 3.4

8.12 Answer: 1500 Hours
June 3, 1985 (1.0)

Ref: TS 3.0.3 Bases

8.13 Answer: No (1.0)
Changing modes is not allowed by TS 3.0.4

Ref: RS 3/4 4-4

8.14 Answer: b. (1.0)

Ref: TS 4.0.2

8.15 Answer: a. 4 (0.5)
b. 2 (0.5)
c. 2 (0.5)
d. 1 (0.5)

Ref: TS 3.4.6.2

8.16 Answer: a. Yes - Note 2, Table 3.4-2 (1.0)
2 gpm is less than
2.5 gpm 50% of band

b. Note 3, Table 3.4-2 (1.0)
reduce to within limits within 4 hours
or be in hot standby within following 6

8.17 Answer: ~~72~~ and 72 ~~(1.0)~~ 0.5

Ref: TS 4.6.1.3, Appendix J (Must Know Appendix J to answer first part)

8.18 Answer: Cold Shutdown (5) (0.5)

Ref: TS 1.0 Definitions

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Key

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

Facility: Crystal River Unit 3
Reactor Type: B & W 177
Date Administered: November 21, 1985
Examiner: D. Falconer
Candidate: _____

INSTRUCTIONS TO CANDIDATE:

Use separate paper for answers. Write answers on one side only. Staple question sheet on top of the answers sheets. Points for each question are indicated in parenthesis 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 four (4) hours after the examination starts.

Category Value	% of Total	Candidate's Score	% of Category Value	Category
25	____	_____	_____	1. Principles of Nuclear Power Plant Operation, Thermodynamics, Heat Transfer and Fluid Flow
22.75 ~~25~~	____	_____	_____	2. Plant Design Including Safety and Emergency Systems
~~24.5~~ ~~25~~	____	_____	_____	3. Instruments and Controls
25	____	_____	_____	4. Procedures - Normal, Abnormal, Emergency, and Radiological Control
97.25 ~~98~~		_____		TOTALS

Final Grade _____%

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

_____
Candidate's Signature

CATEGORY 1 - PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW (25.0)

1.01 [MC] The reactor is brought to 10^{-8} amps during a Xenon free startup. In order to maintain power level at 10^{-8} amps for about one hour, what will have to be done with the control rods? (Assume no other reactivity effects). (1.0)

a. They will have to be withdrawn as Xenon builds in.

b. They will have to be inserted as Xenon burns out.

c. They will have to be withdrawn initially then inserted to compensate for Xenon.

d. They will remain at a constant position because Xenon effects are negligible.

1.02 [MC] During a LOCA with a resultant loss of subcooling margin, Reactor Coolant Pumps (RCPs) are secured for which one of the following reasons: (1.0)

a. To prevent pump damage resulting from operation under two phase conditions.

b. To prevent core damage resulting from phase separation upon subsequent loss of RCS flow.

c. To reduce RCS pressure by removing the pressure head developed by the RCPs.

d. To remove the thermal heat being added to the RCS by the operating RCPs.

1.03 Indicate how natural circulation will be affected by each of the following situations. Consider each one separately and answer INCREASE, DECREASE, or NO EFFECT.

a. Reduction of turbine bypass valve setpoint (0.5)

b. Decrease in OTSG level (0.5)

c. Reduction of feedwater temperature (0.5)

d. Increase in RCS pressure (0.5)

1.04 An ECP is calculated for a reactor startup four hours after a reactor trip from 100% equilibrium conditions. For each of the following situations, indicate if the actual critical rod position would be HIGHER, LOWER or NO CHANGE from the calculated critical rod position. Consider each situation separately and assume no other changes.

a. The startup is delayed until eight hours after the trip. (0.5)

b. The actual boron concentration is 50 ppm lower than that used to calculate the ECP. (0.5)

c. Tavg is 535°F as compared to the value of 532°F used in the calculation. (0.5)

d. OTSG level is stable at 40 inches on the startup range. (0.5)

1.05 During a reactor startup, equal increments of reactivity are added and the count rate is allowed to reach equilibrium each time. Choose the bracketed word(s) that describe what is observed on the Source Range indication and/or Startup Rate (SUR) meter.

a. The change in equilibrium count rate is [larger] [the same] [smaller] each time. (0.5)

b. The time required to reach equilibrium is [longer] [the same] [shorter] each time. (0.5)

c. The point of supercriticality can be identified by a(n) [increasing] [constant] [decreasing] positive SUR several seconds after the reactivity addition is terminated. (0.5)

1.06 [MC] Which one of the following parameter changes will increase the Departure from Nucleate Boiling Ratio (DNBR)? (Consider each separately). (1.0)

a. Reactor Power Increases

b. RCS Pressure Increases

c. RCS Temperature Increases

d. RCS Flow Decreases

1.07 [MC] The unit is operating at 50% load. Each steam generator has 100% loop reactor coolant flow and 50% of the total loop feedwater flow. If loop 'A' loses one of the Reactor Coolant Pumps;

a. the resulting primary flow would be: (% of loop flow) (1.0)

i. loop A < 50%, loop B > 100%

ii. loop A = 50%, loop B = 100%

iii. loop A > 50%, loop B < 100%

b. the feedwater flow, to satisfy the ΔTc controller would be approximately (1.0)

i. loop A = 36%, loop B = 14%

ii. loop A = 25%, loop B = 25%

iii. loop A = 14%, loop B = 36%

1.08 [MC] Which of the following statements is correct if the discharge valve from a centrifugal pump is being partially closed from the full open position? (1.0)

a. Pump head decreases as head loss decreases.

b. Pump head increases as head loss increases.

c. Volume flow rate increases as head loss decreases.

d. Volume flow rate decreases as head loss decreases.

1.09 [MC] The decrease in the effective delayed neutron fraction over core life is due to: (1.0)

a. The reduction in boron concentration.

b. The half-life of U-235.

c. The more negative MTC.

d. The buildup of Pu-239.

1.10 Why should RC cooldown on natural circulation not exceed 10°F/hr for Tc >280°F? (1.0)

1.11 [MC] Which one of the following is NOT expected to be a source of Hydrogen gas accumulation in containment following a LOCA? (1.0)

a. Metal-water reaction involving the Zirconium fuel cladding and the reactor coolant.

b. Reaction of austenitic stainless steel components with boric acid.

c. Radiolydic decomposition of the post accident coolant.

d. Corrosion of metals by building spray water.

1.12 [MC] Delayed neutrons play a major role in the operation of the reactor because they ... (1.0)

a. are born at thermal (slow) energy levels and are therefore more apt to cause fission as compared to being absorbed by a poison.

b. provide approximately 70% of the fission neutron inventory and have a higher importance factor associated with them as compared to prompt neutrons.

c. are born much later than prompt neutrons and therefore effectively lengthen the average neutron generation time.

d. are considered epithermal neutrons and therefore have a smaller probability of leakage than the fast and thermal neutrons.

1.13 Assume that the reactor is at 100% power, beginning of life, with Group 7 rods 90% withdrawn. Indicate if Group 7 must be INSERTED or WITHDRAWN to maintain the reactor at 100% power for the following evolutions. (See APSAR Worth Curve, ~~Figure 1.13~~ 3.9, attached).

a. the insertion of Group 8 from 36% to 15%. (0.5)

b. the withdrawal of Group 8 from 50% to 80% (0.5)

1.14 Indicate if either DNBR or Pressure Boundary protection are provided by the following Reactor Protection System Trips.

a. RCS Pressure-High (0.5)

b. RCS Pressure-Low (0.5)

c. Reactor Coolant Pump Power Monitors (0.5)

d. Nuclear Overpower Based on RCS Flow and Axial Power Imbalance (0.5)

1.15 Indicate if the severity of the following accidents INCREASE or DECREASE with a positive moderator temperature coefficient.

a. Rod Ejection Accident (0.5)

b. Steam Line Break (0.5)

c. Loss of Feedwater (0.5)

d. Rod Withdrawal Accident (0.5)

1.16 Tcold and Group 7 insertion affect the excore power range calibration. Indicate if reactor power determined by the excore detectors will be LESS CONSERVATIVE or MORE CONSERVATIVE with the following conditions.

a. increasing Tcold (0.5)

b. inserting Group 7 (0.5)

1.17 The unit is in Mode 3 (Hot Standby) at the middle of core life with groups 1-4 withdrawn to 100%. If the reactor is shutdown by -4% $\Delta K/K$, indicate if the amount that the reactor is shutdown INCREASES, DECREASES or REMAINS CONSTANT under the following conditions?

a. The RCS boron concentration is decreased by 20 ppm. (0.5)

b. The steam pressure setpoint is increased from 1035 psig to 1070 psig (0.5)

c. RCS pH is increased by adding lithium hydroxide (0.5)

d. Group 5 is withdrawn to 100% (0.5)

1.18 Assume that the reactor is subcritical by 1.0% ΔK/K. Groups 1-4 are 100% withdrawn and Groups 5-7 fully inserted. Indicate if the required Tech Spec shutdown margin is LESS THAN, GREATER THAN or EQUAL TO 1.0% ΔK/K. (0.5)

1.19 In an under moderated core, indicate if an increase in fuel temperature INCREASES or DECREASES the magnitude of the following coefficients.

a. Moderator Temperature Coefficient (0.5)

b. Fuel Temperature Coefficient (0.5)

END OF CATEGORY 1

CATEGORY 2 - PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS (23.0)

2.01 Transfer switches are used to transfer control from the control room to the Remote Shutdown Panel. List the location of each of these four switches. (1.0)

2.02 [MC] When the transfer switches are placed in the 'RSP' position, which statement is correct concerning components necessary for shutdown of the plant? (1.0)

a. Control circuits from the control room are isolated, but ES signals are not defeated.

b. Control circuits from both the control room and the RSP are activated, but ES signals are not defeated.

c. Control circuits from the control room are isolated and ES signals are defeated.

d. Control circuits from both the control room and the RSP are activated and ES signals are defeated.

2.03 TRUE or FALSE

The diesel-generator auto start feature on under-voltage is still active when the transfer switch is in the RSP position. (0.5)

2.04 Two AC oil pumps are provided to supply oil to the feedwater pump/turbine. State the purpose of the third DC Lube Oil Pump. Indicate auto start setpoints. (1.0)

2.05 How many hours does the minimum water volume in the condensate storage tank ensure that the plant can be maintained at Hot Standby conditions with steam discharged to the atmosphere concurrent with a loss of offsite power? (0.5)

2.06 To start a fourth reactor coolant pump, the cold leg temperature must be greater than 500°F. Explain the bases for this interlock. (1.0)

2.07 According to the STM for Core Flood Tanks, what is the most important reason that Core Flood Tank pressure is carefully controlled? (1.0)

2.08 [MC] Which of the following is NOT a Main Feedwater Pump Trip. (1.0)

a. Low exhaust hood temperature

b. Low lube oil pressure

c. Loss of governor speed signal

d. Both feedwater booster pumps tripped

2.09 TRUE or FALSE (0.5)

The idle gland exhauster auto starts on low gland exhaust pressure.

2.10 Answer the following TRUE or FALSE concerning the Nuclear Services Booster Pumps and CRD Cooling System.

a. One pump is normally operated with the other serving as backup. A drop in line pressure (25 psi) will start the idle pump. (0.5)

b. On an ES signal, the supply and return valves will close to the CRDM coolers and the booster pumps will have to be manually secured. (0.5)

c. SWP-2A is powered from ES MCC 3A2 and SWP-2B is powered from ES MCC 3B2. (0.5)

d. Low level in the SW surge tanks will trip the NS booster pumps. (0.5)

2.11 List the automatic actions that occur on a high radiation signal as detected by RMA-11 (waste gas decay tanks discharge to the auxiliary building ventilation system monitor). (1.0)

2.12 [MC] Which of the following is NOT supplied by the secondary services closed cooling water system. (1.0)

a. Exciter coolers

b. Isolate phase Bus Duct

c. Gland Condenser

d. Feedwater Booster Pump Oil Coolers

2.13 Answer the following with respect to the newly installed EFW flow control values; EFV-55, 56, 57, 58.

a. Mode of valve operation (AC, DC, air, or other) (0.5)

b. Failure mode (open, closed, As Is) (0.5)

c. Means for local or manual control (if any). (0.5)

2.14 What is (are) the interlock(s) that ensure condenser vacuum is broken before the EFW pump suction can be shifted from the CST to the hotwell? (1.0)

2.15 Answer the following questions with respect to the pressurizer heaters.

a. Which busses supply power to pressurizer heater MCC 3A & 3B (0.25)

b. How many banks are modulating (0.25)

delete BW ~~c. How many individual heater elements are contained in a bundle (0.25)~~

d. If the normal power to the pressurizer heaters is unavailable, what is the alternate supply. (0.

2.16 Which cooling water system supplies cooling water to the reactor building spray pump motors? (1.0)

2.17 [MC] Which of the following will NOT be found in reactor building spray water. (1.0)

a. sodium hydroxide

b. boric acid

c. potassium sulfate

d. lithium hydroxide

2.18 Explain how the emergency feedwater system promotes natural circulation more so than normal feedwater. (1.0)

2.19 The reactor coolant pump motor may be started three (3) times successively from ambient temperature or twice from rated motor temperature. Additional repetitive starts are governed by motor operating temperature. In the absence of thermal devices to determine both rotor and stator temperatures, what are the guidelines for repetitive starts? (1.0)

2.20 Describe how the 'A' and 'B' spent fuel pools can be isolated from one another. (1.0)

2.21 Maximum flow for the DH pumps is 4000 gpm. Minimum flow is 80 gpm. What is the maximum time that the DH pump can be allowed to operate continuously in the recirculation mode (80 gpm - 100 gpm). (0.5)

2.22 TRUE or FALSE

The mechanical overspeed trip mechanism on the turbine driven emergency feedwater pump can be reset from the control room. (0.5)

2.23 Why shouldn't hydrazine be added to the RCS during operation of the make up demineralizers? (1.0)

2.24 New ES MCC's have recently been installed at Crystal River; MCC 3A3 and MCC 3B3. State the location of each of these MCC's. Include Aux Bldg elevation and reference a nearby piece of equipment or structure. (1.0)

END OF CATEGORY 2

CATEGORY 3 - INSTRUMENTS AND CONTROLS (25.0)

3.01 The turbine bypass valve/atmospheric dump valves may be biased by a 0 psig, a 50 psig or a 125 psig signal. Indicate which of these bias' apply to each of the four situations below.

1. The reactor and turbine are not tripped, the turbine bypass valves are closed, and header pressure deviation is less than 10 psig. (0.5)

2. The reactor is tripped as indicated by a TRIP CONF light on the Diamond Panel. (0.5)

3. The reactor and turbine are not tripped, and ULD is greater than 15%. (0.5)

4. The reactor and turbine are not tripped, and ULD is less than 15%. (0.5)

3.02 The Unit is at 70% load with the ΔTc Controller in Manual (hand). One RCP trips. Answer the following.

a. Will the Unit run back? Why or why not? (1.0)

b. Will feedwater reratio? Why or why not? (1.0)

3.03 Fill in the blanks concerning the Integrated Control System (ICS).

a. During a reactor startup with the Diamond Control Station and the Reactor Demand Station in auto, reactor power is now controlled using the _____ control station. (0.5)

b. When load is between 15 to 18%, the OTSG's will lift off low level limits when the _____ error is greater than _____ error. (0.5)

c. When a startup control valve reaches the 80% open position, a limit switch causes its respective _____ to open. (0.5)

d. With two MFW pumps running and individual loop FW demand reaches 50% the main block valve is signaled to open. As soon as the block valve leaves its closed limit.

i. The loop _____ valve freezes its position. (0.5)

ii. The main feed pump switches from _____ control to _____ control. (0.5)

3.04 List four signals that will automatically shut the main feedwater block valves. (2.0)

3.05 [MC] The synchroscope is rotating slowly in the FAST direction. Which statement is correct concerning the voltages and currents of the Incoming (Diesel-generator) and the running (4kv bus)? (1.0)

a. Incoming and running are in phase, frequency of incoming is higher than running.

b. Incoming and running are in phase, frequency of incoming is lower than running.

c. Incoming and running are not in phase, frequency of incoming is higher than running.

d. Incoming and running are not in phase, frequency of incoming is lower than running.

3.06 Refer to Figure 3.06 which shows one of the Decay Heat Control Units.

a. Match five of the letters on the Figure (a through f) with the following descriptions of each indicator/controller. NOTE: No correct answer for one letter. (1.5)

1. Increases setpoint value when moved upward and decreases setpoint value when moved downward.

2. Indicates value of measurement deviation from the setpoint.

3. Indicates value of the setpoint.

4. Glows dimly when power is on and is extinguished when either the +15v or -15v dc supply fails.

5. Indicates value of remote input.

b. How do DHV-110 and DHV-111 respond to a DH pump Trip if this controller was in the automatic mode? (0.5)

c. Describe the difference between the DH valve control units and Building Spray (BS) valve control units. (What is the additional control feature on the BS units?) (1.0)

3.07 MAR 82-05-01-01 has replaced the existing RB spray actuation circuitry with a new system.

a. List the two sets of conditions, either of which will result in an RB spray PERMIT. (1.0)

b. In addition to the RB Spray PERMIT, what other signal is required for an RB Spray ACTUATION? (0.5)

c. The RB Spray PERMIT, once set, can be reset in anycne of three different ways. List each of these three ways. (1.5)

3.08 Answer TRUE or FALSE to the following statements concerning ASV-204 and ASV-5 (Steam supply valves to turbine driven EFW pump).

a. When both red and green indicating lights are lit, it could mean one valve is fully open and the other is not but you have no way of remotely determining which valve had opened. (0.5)

b. The new valve, ASV-204 was installed in series with ASV-5 to provide redundancy for main steam isolation signals. (0.5)

c. The position indicating lights on the PSA panel, on the local control station and on the RSP are common to both valves. (0.5)

3.09 MAR 77-07-01-11 resulted in changes in the Turbine Bypass Valve and Atmospheric Dump Controls.

a. The existing -10 to +10 VDC control scheme for the TBV's was changed to a 4 to 20 milliamp DC scheme. What was the purpose of this modification? (1.0)

b. Explain the ICS interlocks (s) between the TBV's/ADV's and loss of condenser vacuum. (1.0)

3.10 Answer the following concerning abnormal RCP operation.

a. What two control room indications of abnormal RCP operation, require the pump to be shutdown immediately? (0.5)

b. What control room indication of abnormal RCP operation, requires power level to be reduced to 72%, at 30%/min, then tripping the affected RCP? (0.5)

3.11 The EFIC system will automatically initiate EFW upon detection of various abnormal conditions. For each of the following situations explain the reason or interlock that should prevent EFW from automatically initiating.

a. Reactor power is 10% and the only operating feedwater pump trips. (0.5)

b. Power level is 100% and the signal from OTSG 'A' "Low Range" level fails to 0. (0.5)

delete Bee ~~c.~~ During plant heatup (RC Temp ~ 450°F), the three operating RCP's trip. ~~(0.5)~~

d. At full power an I&C technician causes an HPI actuation of ESAS Channel A only. (0.5)

3.12 TRUE or FALSE

a. It is impossible to return to the "auto" mode on the control rod drive panel if a safety group rod is off its "out limit" position. (0.5)

b. The "auto" mode on the control rod drive panel can be selected with "Sequence Inhibit" indicated. (0.5)

3.13 Answer the following concerning the Safety Parameter Display System (SPDS). See Figures 3 and 5 attached.

a. Which NI, or combination of NI channels, provide the indication for "% PWR"? (0.5)

b. Which incore, or combination of incores, provide the indication when "Incore Temperature" is selected? (0.5)

c. Following a reactor trip the Reactivity Alert feature of the SPDS actuates. What does this indicate? (0.5)

d. What is automatically displayed on the SPDS whenever a reactor trip occurs (i.e., how does the SPDS respond to a trip)? (0.5)

END OF CATEGORY 3

CATEGORY 4 - PROCEDURES: NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL (25.0)

4.01 a. List the Immediate Actions that are common (identical) for the four Runback APs:

Loss of Booster Pump	AP-540
Loss of Main Feed Pump;	AP-541
Asymmetric Rod	AP-542
Loss of One RCP	AP-543

(1.0)

b. List the additional Immediate Actions for AP-541 "Loss of Main Feed Pump Runback." (1.0)

c. Match the runback condition with the approximate power level at which you expect the plant to stabilize. (1.0)

i	Booster Pump	a.	75%
ii	Main Feed Pump	b.	70%
iii	Asymmetric Rod	c.	60%
iv	One RCP	d.	55%
		e.	50%

4.02 An Immediate Action of AP-555, "Continuous Control Rod Withdrawal" is the following:

3. Stop rod withdrawal:
   a. Transfer rod(s) to alternate power supply.

a. Assume the affected rod(s) are in Group 7. List the steps required to transfer the rod(s) to an alternate power supply. (2.0)

b. What are the Remedial Actions associated with Immediate Action (3) above? (1.0)

4.03 During periods when the reactor vessel head is removed, DHV-3, DHV-4 and DHV-41 must be open.

a. List two administrative and/or physical controls that are used to ensure these valves remain open. (1.0)

b. What are these actions intended to prevent? (1.0)

4.04 Fill in the following blanks with regard to containment access during Mode 1 operation.

a. Prior to any containment entry, personnel must obtain a ___(Form)___ and have it signed by ___(Title)___. (0.5)

b. Crew size will be a minimum of ___(number)___ personnel and the maximum time in the containment building will be limited to ___(time)___. (0.5)

c. In the event that there are any personnel in the containment building and the reactor trips ___(action to be taken)___. (0.5)

4.05 [MC] ICS procedure, OP-501 states in part, "If operating signal source malfunctions make signal source transfer necessary, transfer to another signal source should be done..."Which one of the following CORRECTLY completes this statement? Assume the ICS has not responded to the malfunctioning signal. (1.0)

a. immediately after placing the affected ICS station in HAND.

b. immediately, regardless of ICS operating mode.

c. only after checking the computer for a valid alternate signal and placing the affected ICS station in HAND.

d. only after checking the computer for a valid alternate signal; affected ICS station may be in HAND or AUTO.

4.06 The first Immediate Action of AP-380, "Engineered Safeguards System Actuation," is to:

1. Verify valid actuation:
   - RC pressure <1500 psig
   - or
   - Manual actuation

What are the Remedial Actions associated with this step? (1.5)

4.07 Engineered Safeguards has actuated due to low RC pressure.

a. When are you required to stop the Reactor Coolant Pumps? (1.0)

b. Under what conditions (according to the Remedial Actions of AP-380) should the RCPs be kept running? (1.0)

4.08 OP203, Step 6.2.15 states that "When T(ave) is 579±1°F and unit load demand >15%, place Reactor Demand and Diamond Station in Auto." Which station should be placed in auto first? (0.5)

4.09 OP 204, Power Operation, Section 2.0 states that "The expected various parametric system responses for reactor coolant (RC) and steam supply systems are given below. Also included are allowable deviations." Assuming that the reactor is at 50 percent power, what are the expected responses and allowable deviations for the following parameters?

a. RC pressure (.25)
b. RC temperature (average) (.25)
c. RC temperature (inlet) (.25)
d. RC temperature (outlet) (.25)
e. OTSG Outlet Pressure (.25)
f. OTSG Outlet Steam Temperature (.25)

4.10 Fill in the following as stated in OP-401, Core Flooding System.

a. CFV-5 and CFV-6 must be _____ and their breakers in the _____ position; breaker _____ when reactor coolant (RC) is greater than 750 psig. (.75)

b. CFV-5 and CFV-6 must be _____ and their breakers in the _____ position when RC pressure is less than 625 psig. (0.5)

c. Core Flood Tank (CFT), temperature must be above _____ °F before pressurizing the tanks. (.25)

4.11 [MC] Which one of the following "Radiation Area" definitions means the same as that given in RP-101, "Radiation Protection Manual"? (1.0)

a. any area where the dose rate exceeds five mrem/hr or where, in any five (5) consecutive day period, exceeds 100 mrem/hr at any time.

b. any accessible area where a major portion of the body could exceed a dose of five mrem in any one (1) hour, or in any five (5) consecutive days a dose in excess of 100 mrem.

c. any accessible area where any portion of the body could exceed a dose rate of five mrem/hr or where, in any five (5) consecutive day period, could exceed a dose rate of 100 mrem/hr at any time.

d. any area where the dose rate to any portion of the body could exceed a dose of five mrem in any one (1) hour, or in any five (5) consecutive days a dose in excess of 100 mrem.

4.12 TRUE or FALSE: An operator must be stationed at RCV-5 (pressurizer vent valve) to accomplish venting the pressurizer in accordance with OP 202, Plant Heatup. (0.5)

4.13 OP-210, Reactor Startup requires a calculation of estimated critical rod position or estimated critical boron concentration. What are the limits placed on each in terms of % Δk/k if:

a. pulling rods to critical (0.5)
b. deborating to critical (0.5)

4.14 The Immediate Actions of AP-460," Steam Generator Isolation Actuation" call for the operator to ensure valves on affected OTSG(s) are closed and selected closed. Assume a steam line break on OTSG 'A'. List these required valves by name or number. (2.0)

4.15 List the OTSG(s) that should be fed, according to the EFW logic system, for each of the six conditions below: (1.5)

OTSG PRESSURE DIFFERENCE A-B	OTSG PRESSURE A	OTSG PRESSURE B	OTSG FED
100	<600	<600	(1)
-100	<600	<600	(2)
-99 to 99	<600	<600	(3)
N/A	>600	>600	(4)
N/A	>600	<600	(5)
N/A	<600	>600	(6)

4.16 AP-530, "Natural Circulation", gives instructions concerning the symptoms and response to steam voids in the RCS. In order to reduce RC void volume: (choose the correct bracketed words).

a. RC temperature should be [lowered], [stabilized] [raised] (0.5)

b. RC pressure should be [lowered] [stabilized] [raised] (0.5)

c. Pressurizer level should be observed to be [decreasing] [increasing] (0.5)

END OF CATEGORY 4

EQUATION SHEET

Where $\dot{m}_1 = \dot{m}_2$

$(\text{density})_1(\text{velocity})_1(\text{area})_1 = (\text{density})_2(\text{velocity})_2(\text{area})_2$

$KE = \frac{mv^2}{2}$ $\quad PE = mgh$ $\quad PE_1+KE_1+P_1V_1 = PE_2+KE_2+P_2V_2$ $\quad$ where V = specific volume, P = Pressure

$Q = \dot{m}c_p(T_{out}-T_{in})$ $\quad Q = UA\,(T_{ave}-T_{stm})$ $\quad Q = \dot{m}(h_1-h_2)$

$P = P_{o10}^{sur(t)}$ $\quad P = P_o e^{t/T}$ $\quad SUR = \frac{26.06}{T}$

delta K $= (K_{eff}-1)/K_{eff}$ $\quad CR_1(1-K_{eff1}) = CR_2(1-K_{eff2})$

$M = \frac{(1-K_{eff1})}{(1-K_{eff2})}$ $\quad SDM = \frac{(1-K_{eff}) \times 100\%}{K_{eff}}$

decay constant $= \frac{\ln(2)}{t_{1/2}} = \frac{0.693}{t1/2}$ $\quad A = A_o e^{-(\text{decay constant})x(t)}$

Water Parameters

1 gallon = 8.345 lbs
1 gallon = 3.78 liters

1 ft^3 = 7.48 gallons

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 psia = 29.9 in Hg

Miscellaneous Conversions

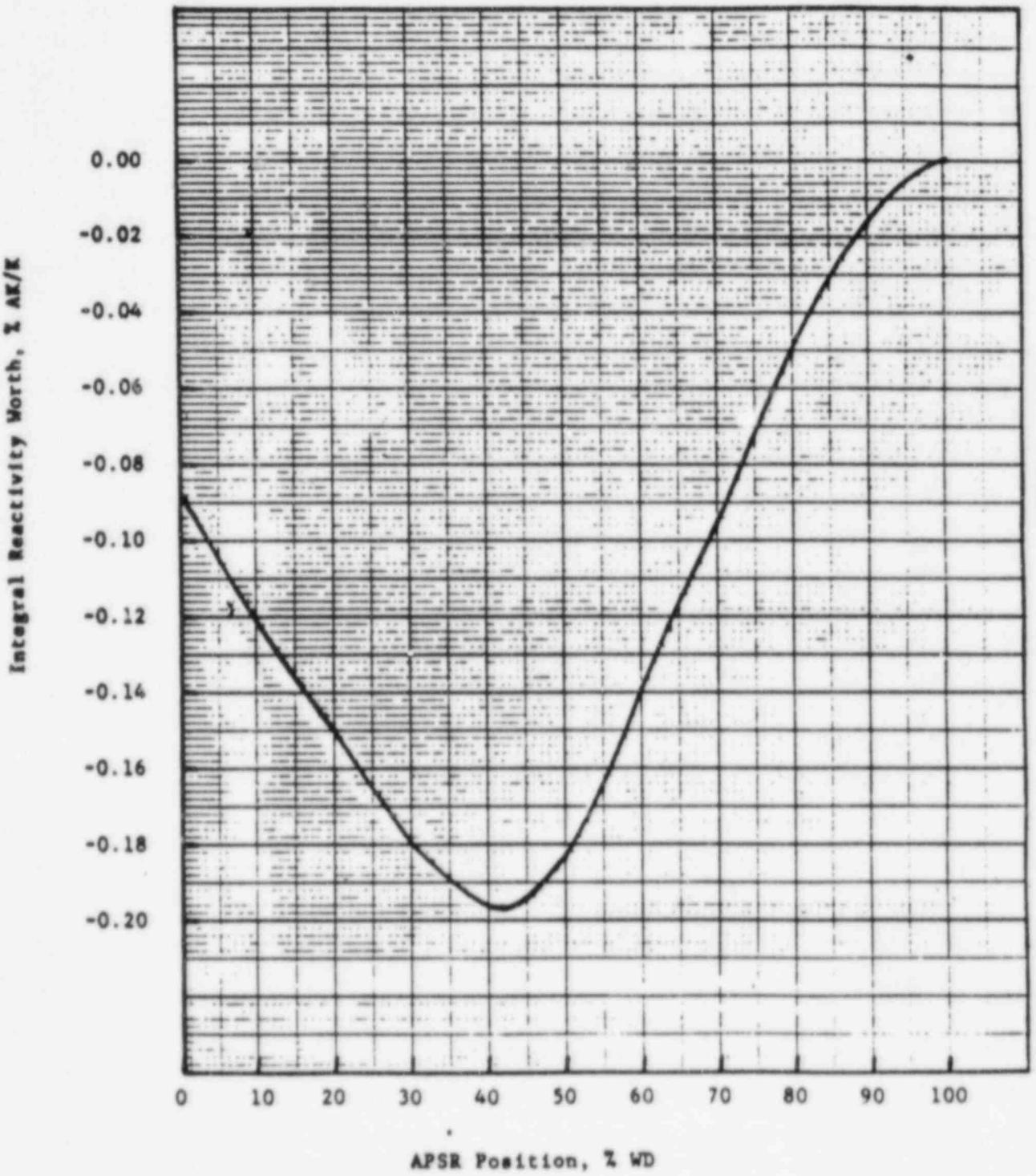
1 Curie = 3.7×1010 dps
1 kg = 2.21 lbs

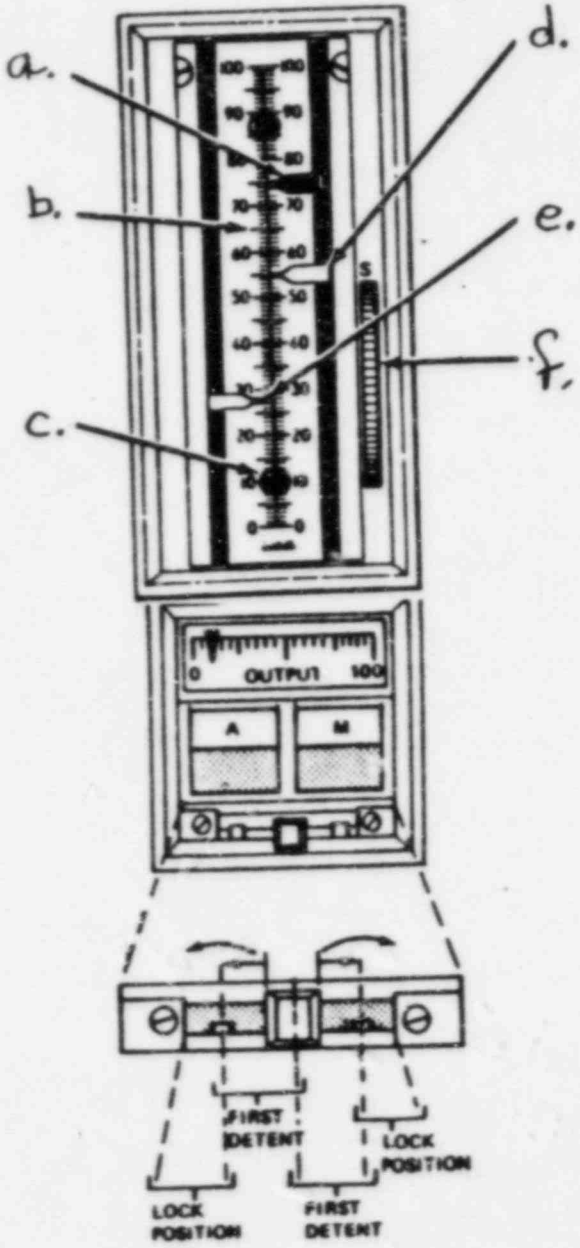
1 hp = 2.54×10^3 Btu/hr

1 Mw = 3.41×10^6 Btu/hr

1 inch = 2.54 centimeters
Degrees F = (1.8) x (Degrees C) + 32
1 Btu = 778 ft-lbf
g = 32.174 $ft\text{-}lbm/lbf\text{-}sec^2$

APSR Integral Reactivity Worth
0% FP, CRG 1-7 at 100% wd, No Xenon





• 3 Manual Drive Lever Novel

FIGURE 3,06

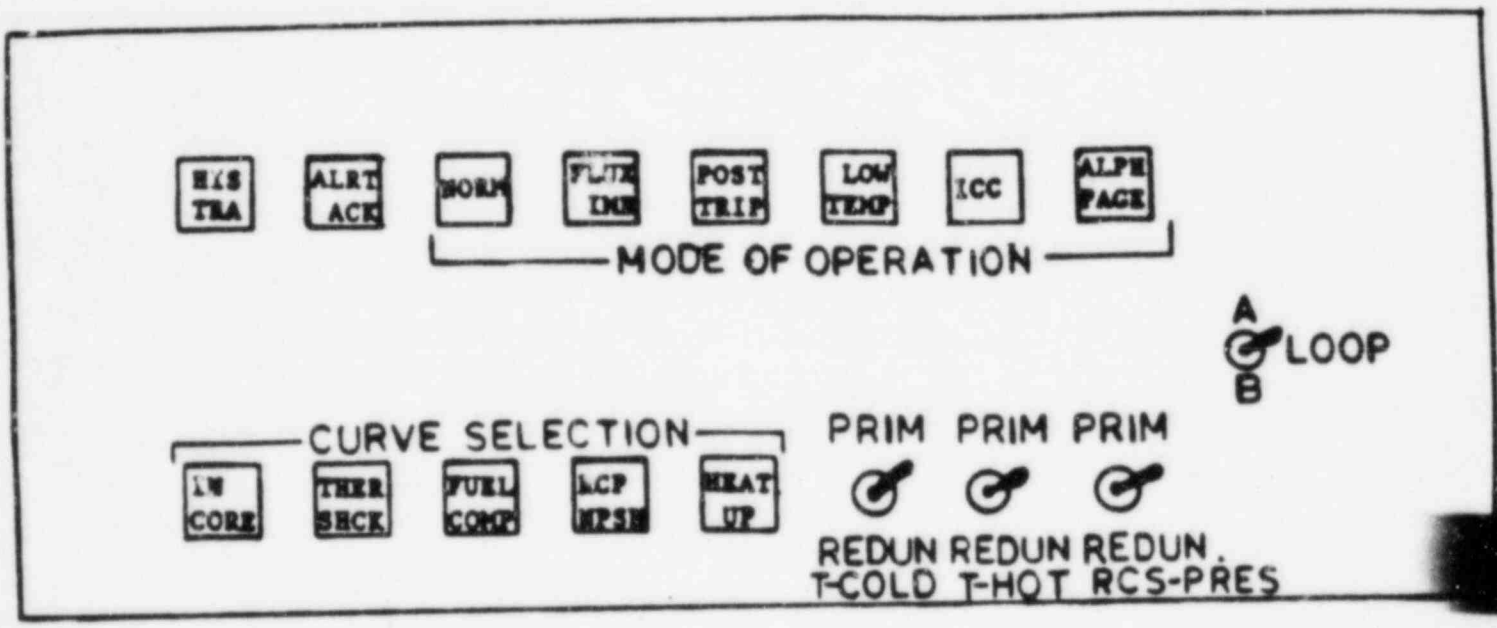
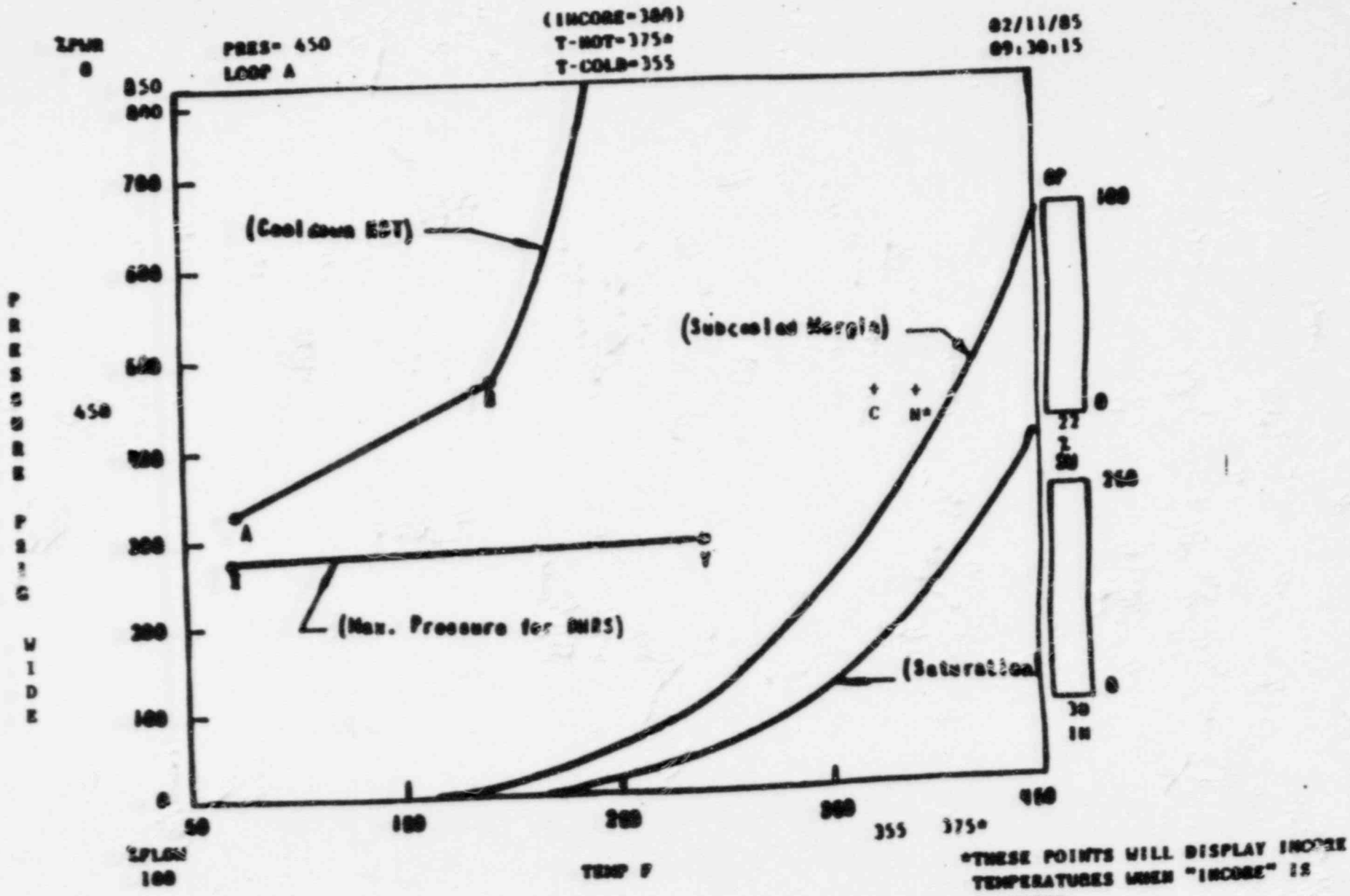


FIGURE 3

SPDS CONTROL PANEL



LOW TEMP HISTORY TRACE THERMAL SHOCK FUEL CONF. RCP RPSH HEATUP

FIG. 8 [redacted] P-T DISPLAY

ANSWERS (CATEGORY 1)

1.1 d (1.0)
Ref: NUS Module 3, Section 10.3

1.2 b (1.0)
Ref: CR Lesson Plan RQ-84-7E Degraded Core Recognition and Mitigation

1.3 a. Increase (0.5)
b. Decrease (0.5)
c. Increase (0.5)
d. No effect (0.5)
Ref: CR3 HTFF, pg 158 & 159

1.4 a. Higher (more Xenon) (0.5)
b. Lower (less negative than used in calc.) (0.5)
c. Higher (Tave increases, more neg, reactivity) (0.5)
d. No change (no effect on Tave) (0.5)
Ref: NUS Manual 3, Section 12.5

1.5 a. Larger (1.5)
b. Longer
c. Constant
Ref: Westinghouse Reactor Physics, Section I-4

1.6 b (1.0)
Ref: Thermo & Heat Transfer Manual, Reactor Heat Transfer and Thermal Hydraulics Section

1.7 a. (i) loop A= 42% loop B = 105% (1.0)
b. (iii) loop A = 14.3% loop B = 35% (1.0)
Ref: Integrated Control System; Handout; B&W, pp IV-4 & 5

1.8 b (1.0)
Ref: General Physics, HT & FF, pg 328

1.9 d (1.0)
Ref: NUS Manual 3, Section 5.3

1.10 (To prevent rapid and erratic changes in pressurizer level from occurring) due to bubble formation in the vessel head. (1.0)
Ref: HTFF, CR-3 Draft Manual

1.11 b (1.0)
Ref: Hydrogen Recombiner, Lesson Plan 83-08-21-01, pg 6

1.12 c (1.0)
Ref: NUS Manual 3, Section 5.2

1.13	a. Inserted	(0.5)
	b. Inserted	(0.5)
	Ref: APSR Integral worth curve at 0% FP, ARO	
1.14	a. Pressure boundary	(0.5)
	b. DNBR	(0.5)
	c. DNBR	(0.5)
	d. DNBR	(0.5)
	Ref: T.S. 2.1, Safety limits bases	
1.15	a. Increase	(0.5)
	b. Decrease	(0.5)
	c. Increase	(0.5)
	d. Increase	(0.5)
	Ref: NUS Module 3, Section 8.4	
1.16	a. More	(0.5)
	b. Less	(0.5)
	Ref: NRC B&W System Manual, p. 8.1-8	
1.17	a. Decreases +P	(0.5)
	b. Increases ↑Tavg -P	(0.5)
	c. Remains constant	(0.5)
	d. Decreases +P	(0.5)
	Ref: NUS Module 3	
1.18	Greater than	(0.5)
	Ref: Technical Specifications 1.0, Definitions SP421 Shutdown Margin	
1.19	a. Increase	(0.5)
	b. Decrease	(0.5)
	Ref: NUS Module 3, Section 9.2	

CATEGORY 2 (Answers)

2.01 2 - are located on the Remote Shutdown Panel - 2nd floor of Control Complex outside of 'B' 4kv Switch Gear Room (0.5)

1 - inside 'A' 4kv ES Switch Gear Room (0.25)
1 - inside 'B' 4kv ES Switch Gear Room (0.25)

Ref: Remote Shutdown Panel, MAR Training, 77-07-01, pg 1

2.02 c (1.0)

Ref: Remote Shutdown Panel, MAR Training, 77-07-01, pg 1

2.03 True (0.5)

Ref: Remote Shutdown Panel, MAR Training, 77-07-01, pg 89

2.04 (1) provide oil to the FW pump/turbine if both AC pumps should fail to allow safe shutdown of the FW pump (0.5)

(2) lube oil pressure 10 psig decreasing (0.5)

Ref: STM 27-22

2.05 Answer: 24 hours (0.5)

Ref: TS B 3/4 7-2

2.06 Answer: This is the core lift interlock @ less than 500°F, the density of water could be sufficient (0.5) such that force exerted by inlet coolant could lift core components. (0.5) (Hydraulic lift considerations) (1.0)

Ref: OP302, RC Pump Operation

2.07 Answer: To ensure that during a large break LOCA, CFT injection will occur immediately after "blowout" of water from the lower part of the core. (1.0)

Ref: STM-4-6

2.08 Answer: a. low exhaust hood temperature (1.0)

Ref: STM 27-72

2.09 Answer: False, No auto starts (0.5)

Ref: STM 30-2

2.10 a. False (0.5)
b. True (0.5)
c. False (0.5)
d. False (0.5)

Ref: STM 23-7, OP-502 p.3, OP-508

2.11 Answer: (1) (closes WDV 439)
(waste gas discharge auto control valve) (0.5)

(2) (closes WDV 393, 394 and 395)
(waste gas decay tank outlet to recycle valve) (0.5)

Ref: STM 41-4

2.12 Answer: c. gland condenser (1.0)

Ref: STM 34-3

2.13 Answer: a. Modulating solenoid valves that use an increasing DC current opposing spring pressure. (0.5)

b. Fail in full open position on a loss of power. (0.5)

c. No provisions for any local or manual control (0.5)

Ref: Lesson: EFW and EFIC; ANO-113, p. 8 & 9

2.14 Answer: EFV-1 and EFV-2 are interlocked such that they can be open only if at least one of the two DC powered condenser vacuum breakers is open. (1.0)

Ref: Lesson: Emergency Feedwater and EFIC, ANO-113, pg 2

2.15 Answer: a. reactor auxiliary 480 Bus A & B (0.25)
b. 3 (0.25)
~~c. 39~~ ~~(0.25)~~
d. 4160V ES Bus B MCC-3B or (0.25)
480v Plant Aux Bus BW

deleted

Ref: STM 2-120, OP 202 step 6.3.1, AP 770 step 5

2.16 Answer: Decay heat closed cooling water (1.0)

Ref: STM 5-1

2.17 Answer: c. potassium sulfate (1.0)

Ref: STM 5-2

2.18 Answer: by admitting water to the upper section of the steam generator thereby cooling the tubes and primary water near the top of the S/6. (1.0)

Ref: STM 2-55

2.19 Answer: (1) after 150 minutes idle time (0.5)
(2) after 25 minutes running time (0.5)

Ref: STM 2-105

2.20 Answer: Installation of gates in the separation wall with inflatable seals pressurized from station air. (1.0)

Ref: STM 21-91

2.21 Answer: 15 hours (0.5)

Ref: OP 404, step 4.2

2.22 Answer False (0.5)

Ref: OP 605 Section 13.3

2.23 Answer: Hydrazine chemical reactive with the resin could result in chloride release. (1.0)

Ref: OP 403, Sec 4.7.10

2.24 MCC 3A3
119' Elev (Aux Bldg) in Corridor near MCC 3A2 - Directly East of Spent Fuel Pools (0.5)

MCC 3B3
95' Elev (Aux Bldg) Outside MUP area (0.5)

Ref: Lesson No. MAR 80-05-14-03

CATEGORY 3 ANSWERS

3.01 1. 50 psig (0.5)
2. 125 psig (0.5)
3. 50 psig (0.5)
4. 0 psig or 50 psig BW (0.5)

Ref: STM CH 504, pg 49 & 50

3.02 a. No runback. (0.5) Load limit for 3-RCP's is 75% (page 12) (0.5)

b. FW will reratio. (0.5) Total FW demand signal is modified by delta between Loop A and Loop B RCS flow (see diagram page 72) (0.5)

Ref: STM CH 504, pages noted above.

3.03 a.	SG/Rx Master or ULD BW	(pg 114)	(0.5)
b.	feedwater flow/level	(pg 116)	(0.5)
c.	low load block valve	(pg 117)	(0.5)
d.(i)	low load control or Control Valves BW	(pg 122)	(0.5)
(ii)	ΔP/flow	(pg 122)	(0.5)

Ref: STM CH 504, pages noted above

3.04 1. FW demand reaches 45% decreasing (2.0)
2. Reactor trips
3. Main FW pump trips
4. EFIC isolation actuation occurs (Channel A or Channel B) BW
5. FWV-28 (crosstie not shut)

(Any 4 of 5; 0.5 each.)
Ref: OP-504, Rev. 12, pg. 9

3.05 c (1.0)

Ref: Power System Operation, R.H. Miller, pg. 17

3.06 a. 1-F
2-D
3-A
4-C
5-E

(0.3 each; 1.5 Total)

b. Upon DH pump trip, the DH valve will remain in its current position until changed by operator (pg 5) (0.5)

c. BS valve control units have an additional control feature, there is a Remote (R) and a Local (L) setting on the left side of the display unit. Remote position - fixed voltage signal corresponding to 1550 gpm is sent to valve controller. (1.0)

Ref: MAR Training: 83-09-03-01, pg 5

3.07 a. 1. HPI Block 3 and Block 4 actuated on 2 out of 3 channels (RC-1, RC-2, RC-3) or (0.5)
2. HPI bypassed after an actuation on 2 out of 3 channels (RC-1, RC-2, RC-3) (0.5)

b. 30 psig signal [2 of 3 channels RB-4, RB-5, RB-6] (0.5)

c. 1. 2 new reset pushbuttons on ESF-A&B sections of main control board (0.5)
2. If HPI is bypassed and the associated ES 4160V bus UV relays actuate, the permit will be automatically reset. (0.5)
3. If HPI is bypassed and is then reactuated by either LPI or RB 150 and COOLING, the permit will automatically be reset. (0.5)

Ref: MAR TRAINING, #82-05-01-01, ES LOGIC MODIFICATION, pg 2 & 3

3.08 a. True (0.5)
b. False (parallel) (0.5)
c. True (0.5)

Ref: Lesson No. 80-11-48-01/02/03

3.09 a. Ensures that the TBV's remain closed on a loss of power. (1.0)

b. On loss of CW pumps or low vacuum, the ICS will close the TBV's. (Circuitry in the ICS that shifted header pressure control to ADV's [for loss of CW pumps and low vacuum] has been removed.) (1.0)

Ref: Lesson No. 77-07-01-11

3.10 a. controlled bleed off temp ≥ 170°F (verified), (.25)
high seal stage pressure drop ≥ 2/3 RCS pressure or loss of both (.25)
b. Total seal outflow exceeds 2.5 gpm seal injection and (.25)
and is rapidly increasing component cooling (.25)

Ref: OP 302, page 5

3.11 a. Reactor power must be >20% for auto initiation on loss of both main FW pumps (pg. 14) (0.5)

b. 1 of 2 Taken Twice logic - Only one bus relays are energized (pg 13 - Fig. 5A) (0.5)

deleted c. EFIC is manually bypassed (loss of all RCP initiation) when reactor power is <18%. (pg 14) ~~(0.5)~~

d. Initiation of EFW requires HPI actuation of Both A & B ESAS channels. (pg 14) (0.5)

Ref: ANO-113 Emergency FW & EFIC pp-noted above.

3.12 a. True (0.5)

b. False (0.5)

Ref: OP 502 4.25 & 4.26

3.13 a. Highest of 4 Power Range NI's (0.5)

b. Average of 5 highest incore readings
(12 incore inputs into SPDS) (0.5)

c. Source Range count rate >1000 cps, (.25)
and all rods are in. (.25)

d. The SPDS display will automatically switch
to the Post-Trip Screen (.25)
with the history trace on (.25)

Ref: MAR Training, SPDS

CATEGORY 4 - ANSWERS

4.01 a. 1. Ensure turbine runback
2. Ensure RC stable (1.0)

NOTE: All but AP-542 say "Ensure control rods inserting", AP-542 says "Ensure NI power lowering."

b. Ensure: (1) affected MFP tripped
(2) OPEN - FWV-28 (cross-tie)
(3) CLOSED - FWV-29 and FWV-30
(4) Ensure control rods inserting (1.0)

c. i - 55% - d
ii - 55% - d
iii - 60% - c
iv - 70% - b (1.0)

4.02 NOTE: OP-502 Step 12.1 says to refer to Section 7.1. This section addresses Safety Group Transfer from DC Hold to Auxiliary.

a.

Select:	All (Optional)	(0)
Select:	Manual	(.2)
Select:	SEQ-OR	(.2)
Select:	Aux	(.2)
Select:	Group desired	(.2)
Depress	Transfer Reset	(.2)
Select:	Jog	(.2)
Select:	Clamp	(.2)
Press:	Manual Transfer	(.2)
Press:	Clamp Rel	(.2)
Press:	Group	(.2)
Select:	Run, if desired	(0)

1. Select MANUAL BW (2.0)
Select ROD GROUP
Select ALL (optional)
Select AUX
Select SEQ-OR
Select JOG
2. Verify SYNC
3. Select CLAMP
4. Select MANUAL TRANSFER
5. Select CLAMP RELEASE
6. Select GROUP
7. Select RUN (if desired)

Ref: OP-502, Rev. 17, Step 7.1.1 through 7.1.10

b. Trip Reactor AND (.5)
go to AP-580 (.5)

4.03 a. 1. Breaker control handle placed in "Lock-Reset" position (0.5)

2. Control will be under Shift Supervisor and the breakers and valves shall be blue-tagged (0.5)

b. In order to prevent isolation of the DH systems due to a spurious 284 psig signal (0.5) (0.5)

Ref: OP-404, Rev. 53, pg. 4.

4.04 a. Radiation Work Permit (.25)
Shift Supervisor (.25)

b. 2 (.25)
1 hr (.25)

c. Sound containment evacuation alarm. (0.5)

Ref: OP-417, Rev. 38 pgs 4 and 36

4.05 Answer: b (1.0)

Ref: OP-501, Rev. 8, pg. 3.

4.06 1. Bypass ES Actuation (0.5)
2. Return ES Equipment to Standby status (0.5)
3. Go to VP-580 (0.5)

Ref: AP-380, Rev. 04, pg. 3.

4.07 a. If subcooling margin is inadequate (1.0)
$\geq$ 1500 psig 20°F
$\leq$ 1500 psig 50°F

b. If all RCPs have not been stopped within two minutes, they must be kept running (1.0)

Ref: AP-380, Rev. 04, pg. 4.

4.08 Answer: Diamond (0.5)

Ref: OP-203, pg. 12

4.09 Answer: a. 2155 ± 100 ~~psig~~ (.25)
b. 579 ± 3.5°F (.25)
c. 568 ± 3.5°F (.25)
d. 590 ± 3.5°F (.25)
e. ~~891 ± 9 psig~~ 900 ± 10 psig (.25)
f. 588 ± 5°F (.25)

Ref: OP-204, Section 2.0

4.10 a. Open, Locked Reset, Locked (.75)
b. Closed, Locked Reset, (0.5)
c. 69 (.25)

Ref: OP-401

Allowance of ± 2°F or ± 2 psig on setpoint and ± 1°F or ± 1 psig on tolerance BW

4.11 Answer: b (1.0)

Ref: RP-101, p. 5

4.12 Answer: True (0.5)

Ref: OP-202, Step 6.3.2

4.13 a. ≥ 1% Delta K/K (0.5)
b. ≤ 1% Delta K/K (0.5)

Ref: OP-210, Enclosures 3 and 4

4.14 OTSG A

MSV-411 & 412 (MSIVs)
FWV-30 (MBV)
FWV-31 (LLBV)
FWV-36 (SUBV)
FWV-28 (Cross-tie)
FWV-14 (FWP Suction)
FWV-35 (EBV)
~~NOTE: Step 3 - MSV-55~~
NOTE: Step 4 - Ensure Closed
MSV-9 & 10 (TBVs)
MSV-25 (ADV)

Also accept OTSG A and OTSG B valves ~~to~~ (0.2 ea)

Ref: AP-460, Rev. 02, pg. 2

4.15 (1) - A
(2) - B
(3) - A, B
(4) - A, B
(5) - A
(6) - B

(0.25 ea)

Ref: AP-460, Rev. 02, pg. 5.

4.16 a. Stabilized (0.5)
b. Raised (0.5)
c. Decreasing (0.5)

Ref: AP-530, Rev. 04, pg. 14.