U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 W. Michigan Ave.
Jackson, MI 49201

Facility Name: Palisades Nuclear Plant

Examination Administered At: Palisades Nuclear Plant and Palisades Simulator

Examination Conducted: June 26, 1984 through July 1, 1984

Examiners: R. L. Higgins — Date: 8/14/84

R. L. Higgins for G. Streier — Date: 8/14/84

R. L. Higgins for J. Whittemore — Date: 8/14/84

Approved By: J. I. McMillen, Chief, Operating Licensing Section — Date: 8/14/84

Examination Summary

Examination administered during the period June 26, 1984 through July 1, 1984. Written, oral, and simulator examinations were administered to one SRO candidate, six instructor certification candidates, and three RO candidates. Results: One SRO candidate, four instructor certification candidates and three RO candidates passed. Two instructor certification candidates failed.

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REPORT DETAILS

1. Candidates Examined

SRO Candidates

Thomas C. Anderson

RO Candidates

Ted B. Jones
Michael R. Ovington
Fredric S. Ruell

Instructor Candidates

Paul E. Buttonow
Ronald G. Leblond
Thomas R. Loudensloger
Richard E. Miller
Danny C. Rogers
Dennis J. Willemin

2. Examiners

*R. L. Higgins
G. Streier
J. Whittemore

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations the examiners met with the following Consumers Power Company employees to review the written examinations and answer keys:

A. S. Kanicki - Training Shift Supervisor
R. Massa - Shift Engineer
R. B. Heimsath - General Nuclear Instructor
W. W. Hunt - Senior Nuclear Instructor
W. E. Drummond - Licensed Control Operator I
E. A. Dziedzic - Training Supervisor

The following comments were made concerning the RO written examination:

a. In the answer for question 1.01b, the facility representatives requested that the answer be expanded to accept "neutron competition" as an acceptable response. Since the value of reactivity coefficients is directly related to the relative affinity for neutron absorption demonstrated by the various constituents, the request was granted.

b. Facility representatives requested that question 1.02 be deleted, contending that the plant does not perform primary and secondary heat balances, but a composite. The chief examiner checked GLC 12, the Power Instrumentation Calibration Form, which details specific steps for the performance of a secondary heat balance. The facility representatives' request was denied.

c. In the answer for question 1.05a, the facility representatives requested that all references to control rod position be eliminated since the plant operates with all rods full out. Because the plant could not remain at a constant power level during a boron addition unless control rods were partially inserted and thus available to be withdrawn, the facility representatives' request was denied.

d. In the answer for question 1.05b, the response "samarium" was awarded partial credit. Though samarium is not considered in the shutdown margin determination at Palisades, it does affect the shutdown margin.

e. In the answer for question 1.11c, the facility representatives requested that both the answers "true" and "false" be granted full credit. Since the value of the latent heat of vaporization and the latent heat of condensation are identical, the request was denied.

f. The facility representatives contended that question 1.12a was not worded in accordance with NUREG 1021, ES-202, E-17, which requires that the question be reviewed to ensure that it will elicit the intended answer. The question is worded in an unambiguous manner and full credit will be awarded if the examinees response is reasonable, so the facility representatives' contention was denied.

g. The facility representatives contended that question 2.06 was a double jeopardy question, since part "b" required the student to correctly answer part "a". Since the auxiliary feedwater system is extremely important, and the combined point value of both parts is 3.5 points, only 14% of the section and thus well within the guidelines of the examiner standards, the contention was denied.

h. In the answer for question 2.07 the facility requested that both "3.7 psig" and "5.0 psig" be accepted as correct responses because the Technical Specification value had been changed from "5.0 psig" to "3.7 psig" after copies had been sent to the examiner. Technical Specification Amendment 81 was checked to verify this fact, so the facility representatives' request was granted.

i. In the answer for question 3.03c the facility representatives stated that the annunciator "SV and/or PORV open" is not an absolute indication that a PORV is open. However, it is an indication that a PORV may be open so the answer was not changed.

j. In the answer for question 3.08a the facility representatives requested that full credit be accorded for the response T hot and T cold. They referenced Technical Specifications page 2-8, which was verified, so the facility representatives' request was granted.

k. In the answer for question 3.08b, the facility representatives stated that the terminology was incorrect. The Palisades terminology is CRDM instead of CEA, and RWP instead of CWP. The answer was changed to reflect the Palisades terminology.

l. In the answer for question 3.08c the facility representatives requested that "rod rundown" not be a required response. Since there are several design criteria used to minimize the possibility of an ATWOS, reasonable answers which mention these design criteria will be granted full credit.

m. In the answer for question 3.09a the facility representatives requested that the backup heaters not be required for full credit since they are normally operated in manual and thus are always energized. This was confirmed by checking Palisades procedure SOP-1, Primary Coolant System, Revision 13, Section 7.3.2, Pressurizer Pressure Control, so the answer was changed.

n. In the answer for question 4.01 the facility representatives requested that "pump seal controlled bleed off flow below alarm setpoint" be accepted as a correct response. The facility representatives' request was verified by checking SOP 1, step 7.2.9.b, so the answer was expanded to accept this response as one of the two required parameters.

o. In the answer for question 4.02a, the response "HPSI pumps adding water to the PCS" was accepted as a correct response since HPSI pumps can be used to maintain PCS inventory during the reduced pressure of a cooldown.

p. In the answer for question 4.04 the facility representatives stated that the bleeder trip valves do shut on a turbine trip, so there is no correct answer for this question. The reference - Phase III-5 SLN 19, drawing No. 3 - was checked to verify the facility's statement. The question was deleted.

q. In the answer for question 4.05c the facility representatives requested that the answer "steam bypass to the condenser" be accepted as a correct response. Because steam pressure would be reduced in conjunction with PCS temperature if the aforementioned technique were used, greatly prolonging the steam generator tube rupture, the facility representatives' request was denied.

r. In the answer for question 4.07b the facility representatives requested that full credit be given for the response "1250 mrem per quarter" since the question does not specify whether the individual's accumulated dose for previous calendar quarters had been determined. The reference, Admin. Procedure 7.04 Step 5.1, was verified, so the answer was expanded to grant full credit to the response "1250 mrem per quarter." Half credit was awarded if the examinee answered using the control level instead of the limit.

s. In the answer for question 4.10, the response "pressurizer level erratic or rising abnormally rapidly" was accepted as a correct response, since voids in the core would displace water into the pressurizer. This response is referenced in EOP 8.1, "Loss of Primary Coolant" on page 8.

t. In the answer for question 4.12a.1 the facility representatives requested that the answer be changed from "no" to "yes" since Startup Channels are required by Technical Specifications, Table 3.17.4. This reference was verified and the answer changed.

u. In the answer for question 4.12.a.5 the facility representatives requested that both "yes" and "no" be accorded full credit since the word "datalogger" may be misleading, since the primary data logger is required while the feedwater purity datalogger is not required. The request was rejected since the datalogger of greatest concern to and most frequently used by the operators is the primary datalogger, so no ambiguity should exist.

v. In the answer for question 4.12b, the response "DNBR 1.3 or greater" was accepted as a correct response since the basis for the Technical Specification curves is to maintain DNBR at or above 1.3.

The following comments were made concerning the SRO written examination:

a. In the answer for question 6.2b the facility representatives stated that a steam generator level of 28.7% was equivalent to 447 inches above the support skirt. The Plant Modification and Level Setpoint document was referenced, so the answer was expanded to accept 28.7% as a correct response.

b. In the answer for question 6.4a the facility representatives noted that "shutdown cooling relief" was entered twice. This was a typographical error, so the correct response "letdown line relief" was substituted for one of the redundant answers.

c. In the answer for question 6.5a the phrase "from the loop associated with the reactor regulator system being used for control" was considered trivial by the examiner and will not be required for full credit.

d. In the answer for question 6.5b the facility representatives requested that setpoints not be required for full credit. This was accepted since the question itself did not ask for setpoints. The facility representatives also requested that backup heaters not be required for full credit since they are operated in manual and always energized. The reference, SOP-1 Step 7.3.2 was verified and the request accepted. In addition, the responses "Stop #2 and #3 Chg Pumps," "Open #2 and #3 orifice stop valves," and "High level error alarm actuates" were considered trivial and/or redundant and will not be required for full credit.

e. In the answer for question 6.7a the examiner considered the phrase "to provide for additional heat removal or to provide a backup capability for the fuel pool heat exchangers" to be trivial and will not be required for full credit.

f. In the answer for question 6.8 the facility requested that the following system functions listed on page 1 of System Lesson Notes No. 42 be accepted as correct responses: monitor engineered safeguards systems; isolate failed static components and activate redundant static components; control shutdown systems and boric acid systems; monitor the primary system to perform hot shutdown and cold shutdown without access to the control room. Since the question asked for functions the facility representatives' request was granted.

g. In the answer for question 7.9c the facility representatives requested that resetting the DBA sequencer no longer be required for full credit since a recent modification removed this requirement. During the examination each of the examinees brought this fact to the attention of the examiner and were told to explain the old procedure and mention the recent modifications on their papers. The request was therefore denied.

h. The answer for question 8.14c was changed to accept "2" as correct, since a recent modification eliminated one high pressure safety injection pump, leaving only 2, one on each bus.

4. Exit Meeting

At the conclusion of the visit to the Palisades Simulator and the Palisades Nuclear Plant the chief examiner, Mr. R. L. Higgins, met with the following facility personnel:

Mr. Montross, the Plant Manager
Mr. Kozup, the Operations Supervisor
Mr. Hunt, a Senior Nuclear Instructor
Mr. Malone, a Licensing Engineer
Mr. Heimsath, a General Nuclear Instructor

This meeting was held to discuss the known results of the examination as well as other observations noted by the examiners while they were at the plant and at the simulator.

a. The facility representatives were informed that of the seven oral/simulator examinations administered five examinees definitely passed, one examinee was marginal, and one examinee did not show up to take his oral examination at the plant.

b. While conducting the simulator examinations the following items were noted:

1. The auxiliary feedwater system used at the simulator has not yet been updated to reflect recent plant modifications. The facility intends to modify the simulator in the near future to more closely model the plant's current auxiliary feedwater system.

2. Initial conditions modeled on the simulator did not correspond to steps in the Palisades procedures. Initial conditions should correspond to definite steps in the plant startup or shutdown procedures, with all applicable precautions, Technical Specifications, and preceding steps completed or observed.

c. Many System Lesson Notes are outdated and no longer accurately describe plant components. The current revision of System Lesson Notes was produced in 1980, and since then many significant plant modifications have been made. The System Lesson Notes need to be revised to reflect the plant modifications. The facility is currently in the process of revising the System Lesson Notes and prior to the next exam will send the examiners copies of all updated versions which have been approved.

d. Plant and simulator personnel were extremely cooperative during the examination. The control room operators were involved in conducting a plant heatup and forming a bubble in the pressurizer while the exams were being conducted, but they were nonetheless extremely accommodating. The simulator operators were also especially helpful.

The plant was complimented for being unusually clean, considering the extended outage from which the plant was recovering.

QUESTION DELETED FROM THE RO WRITTEN EXAMINATION

Question No. 4.04

Reason for Deletion: There is no correct answer.

U. S. NUCLEAR REGULATORY COM ISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: PALISADES

REACTOR TYPE: CE-PWR

DATE ADMINISTERED: 82/06/26

EXAMINER: SIBLEY, G.

APPLICANT:

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INSTRUCTIONS TO APPLICANT:

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

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.13			1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
25.00	25.13			2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
25.00	25.13			3. INSTRUMENTS AND CONTROLS
24.50	24.62			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
99.50	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 1.01 (2.10)

HOW does the moderator temperature coefficient change as the following conditions change in an undermoderated reactor core? EXPLAIN.

a. Moderator temperature increases. (1.2)

b. Boron concentration in the moderator increases. (1.2)

QUESTION 1.02 (2.00)

Why is a secondary heat balance more accurate than a primary heat balance for determining the reactor heat output? (2.0)

QUESTION 1.03 (3.00)

During a reactor startup, will the actual critical position be HIGHER, LOWER or the SAME as the estimated critical position calculated before the following changes? EXPLAIN your choices. (Consider each change separately).

a. The operator starts warming the main turbine prior to reaching criticality. (1.0)

b. Actual boron concentration was 30 ppm higher than the value used for figuring the ECP. (1.0)

c. Startup was delayed 4 hours beyond the ECP time; a shutdown time of 16 hours was used for the ECP. (1.0)

QUESTION 1.04 (1.50)

The ratio of Pu-239 to U-235 atoms increases over core life. Will this ratio change cause:

a. an INCREASE or DECREASE in the effective delayed neutron fraction (Beff)? (0.75)

b. a SLOWER or FASTER reactor response during reactivity transients? (0.75)

QUESTION 1.05 (2.50)

a. Explain the effect on Shutdown Margin of a 25 ppm boron addition while operating at 50% power. (1.0)

b. List three (3) factors, other than RCS boron concentration, which affect Shutdown Margin and are used in the SDM calculation. (1.5)

QUESTION 1.06 (2.00)

Would Power Range indications tend to indicate an INCREASE, DECREASE, or NO CHANGE for the following events? Assume actual power is constant at 75% before and after the event. Briefly explain your answer. (Consider each separately.)

a. Core aging. (1.0)
b. Increase in boron concentration. (1.0)

QUESTION 1.07 (2.00)

Indicate how the following changes in plant conditions would individually affect DNBR (increase, decrease, or have no effect).

a. Pressurizer pressure decreases
b. Tc decreases
c. Reactor power decreases
d. RCS flow decreases (2.0)

QUESTION 1.08 (.60)

True or False?

At EOL, with decreased fuel temperatures, the Fuel Temperature Coefficient is more negative due to an increase in the quantity of Pu-240 in the fuel. (0.6)

QUESTION 1.09 (2.00)

For each of the following conditions, which of the two choices would the INDIVIDUAL (differential or integral as indicated) rod worth be greater?

	Rod Worth	Condition	Choice 1	Choice 2	
a.	Integral	Tave	150-F	500-F	(0.5)
b.	Integral	Core life	BOL	EOL.	(0.5)
c.	Differential	Rod position	80 inches	130 inches	(0.5)
d.	Differential	Rod in Group 6 which is next to a module with	an inserted rod	the rod withdrawn	(0.5)

QUESTION 1.10 (2.00)

a. If steam goes through a throttling process, specifically as in a leak from a main steam header high pressure line to atmosphere, will the following parameters Increase, Decrease, or Remain the Same? (no explanation required) (1.5)

1. Enthalpy
2. Pressure
3. Entropy
4. Specific volume
5. Temperature

b. State whether the steam will be Subcooled, Saturated, or Superheated at the point where it leaks out. (0.5)

QUESTION 1.11 (3.00)

True or False?

a. The differential temperature necessary to transfer heat is inversely proportional to heat flux at values of heat flux less than DNB. (0.5)

b. Pump runout is the term used to describe a centrifugal pump when it is pumping against a shut discharge valve. (0.5)

c. The latent heat of vaporization is another term for the latent heat of condensation. (0.5)

d. One of the pump laws for centrifugal pumps states that power required by the pump motor is directly proportional to the square of the pump speed. (0.5)

e. The faster a centrifugal pump rotates, the greater the NPSH required to prevent cavitation. (0.5)

f. When comparing a parallel-flow heat exchanger to a counter-flow heat exchanger, the temperature difference of the two fluids along the LENGTH of the heat exchanger tubes is MORE uniform for the parallel-flow heat exchanger. (0.5)

QUESTION 1.12 (2.00)

Assume that your plant has experienced a degraded power condition and that you are monitoring the plant's cooldown on natural circulation. Explain WHETHER and WHY you agree or disagree with the following statement :

a. A slow downward trend in INDICATED level is a good indication of well-established natural circulation flow. (1.0)

b. A difference between wide-range Th and wide-range Tc of 65°F and slowly increasing, indicates developing natural circulation flow. (1.0)

QUESTION 2.01 (3.00)

Describe TWO flow paths the operators can use to minimize or mitigate the precipitation of boric acid in the core after a primary rupture/leak with subsequent safety injection. Include in your answer how these flow paths minimize boric acid precipitation. (3.0)

QUESTION 2.02 (1.00)

TRUE or FALSE?

a. Each safety injection tank has a flow restricting orifice in its discharge line which is provided to extend the SIT blowdown time which in turn reduces the peak fuel cladding temperature in the event of a LOCA. (0.5)

b. The design condensing capacity of the quench tank is based on accepting all postulated load rejections with no steam dump system availability. (0.5)

QUESTION 2.03 (3.00)

a. Explain the provisions available to remove fission products from the containment during accident conditions. (1.5)

b. How will a loss of the Shutdown Cooling Heat Exchanger affect the removal of fission products from the containment atmosphere? (1.5)

QUESTION 2.04 (3.20)

The following concern the Palisades Main Turbine control system:

a. What is the difference between the reference counter and the setter counter? (1.0)

b. What happens when the turbine latch button is depressed? (3 required) (1.2)

c. What function does the "zero speed indicator" perform? (1.0)

QUESTION 2.05 (2.00)

a. A connection is provided from the SIRWT to the CVCS, what two major functions does this provide for? (1.0)

b. There is a connection between the shutdown cooling system and the spent fuel pool for added cooling purposes. When would this added cooling be needed? (1.0)

QUESTION 2.06 (3.50)

a. Draw a simplified drawing of the new aux. feedwater system. Include all major components, valves and water sources. (2.0)

b. On the above drawing, show the normal water flow path, if the following conditions exist.

A S/G Pressure = 740 psia
B S/G Pressure = 575 psia
A S/G level = 25%
B S/G level = 23% (1.5)

QUESTION 2.07 (3.00)

a. If a main steam line rupture, downstream of the MSIV, were to occur, why do we desire rapid closure of the MSIV? (two required) (1.0)

b. What condition(s) will automatically close the MSIV? (Include setpoints and logic) (2.0)

QUESTION 2.08 (2.10)

What THREE systems at Palisades CAN be provided with the water from the fire protection system? Include a BRIEF explanation of what is required to connect the fire protection system. (Spool-piece, locked valve, etc.) (2.1)

QUESTION 2.09 (4.20)

a. What are FOUR benefits of using hydrogen in the main generator instead of air or nitrogen? Explain your answer. (3.2)

b. What function does the following two components provide for the CARBOX system?

1. Steam vaporizer

2. Electrical gas heater (1.0)

QUESTION 3.01 (3.70)

Assume it becomes necessary to perform maintenance on Inverter #4 during a plant cooldown with the Reactor Coolant System at 480 F and 1550 psig.

a. Explain an alternate method of providing power to the effected preferred 120 VAC instrument bus starting from the 2400 VAC essential power supply, assuming a normal lineup. (1.8)

b. What problem(s) may be encountered during the transfer of power and how could this/these problem(s) be mitigated? (1.9)

QUESTION 3.02 (4.10)

a. With the plant at full power, what will be the effect on the Steam Generator feed water regulating valves upon a loss of air supply to the valves? Explain how the system functions to accomplish this desired effect. (1.6)

b. Describe the three over-ride features associated with the Steam Generator Level Control system. (1.5)

c. How is the signal developed that is sent to the main feed pump speed controller? (1.0)

QUESTION 3.03 (1.50)

The following three annunciators are for the LTOP subsystem. Explain what each annunciator is telling you when it alarms.

a. "NO PCS PROTECTION"

b. "PCS PRESSURE 325 psig"

c. "PORV OPEN" (1.5)

QUESTION 3.04 (3.50)

Describe how the Steam Dump AND Bypass system will function as a result of the following transients: (Be specific)

a. 10% load rejection from 35% power. (1.5)

b. Turbine trip from 75% power. (2.0)

QUESTION 3.05 (2.50)

a. The wide range log channels use the campbelling technique and conventional pulse counting. Why are both techniques used instead just the conventional pulse counting? (1.0)

b. Briefly explain how the campbelling theory works in the wide range log channels. (1.5)

QUESTION 3.06 (3.00)

How would the following indications be affected (INCREASE, DECREASE or NO CHANGE) by the associated condition change listed below? Consider each indication separately and EXPLAIN your answer.

INDICATION	CONDITION CHANGE
a. Nuclear Wide Range Instrument	Cold leg temperature increases 50 F at constant true nuclear power (1.0)
b. Pressurizer level	Differential pressure transmitter reference leg temperature increases 10 F. (No change in actual level) (1.0)
c. Steam Generator level	Control steam flow signal increases (No change in actual steam flow) (1.0)

QUESTION 3.07 (1.20)

What TWO conditions will prevent an automatic transfer of the 2400 VAC buses from the station power transformers to the startup transformers? (1.2)

QUESTION 3.08 (3.50)

Concerning the Reactor Protection System (RPS):

a. What FOUR inputs are used to develop the TM/LP trip signal in the TM/LP calculator? (1.6)

b. What TWO conditions will generate a CRDM withdrawal prohibit (CWP)? (1.0)

c. Why is it considered a very remote possibility for Palisades to experience an ATWS (Anticipated Transient Without Scram)? (0.9)

QUESTION 3.09 (2.00)

a. List sequentially the THREE automatic actions which would occur, due to signals from the pressurizer (PZR) level control program, if PZR level is decreased from the high level alarm to the programmed level. (Disregard action of the alarm clearing) (1.2)

b. List sequentially the TWO automatic actions which would occur, due to signals from the PZR level control program, if PZR level is increased from the PZR low level alarm to the programmed level. (Disregard action of the alarm clearing) (0.8)

QUESTION 4.01 (2.00)

With three pumps (PCP's) operating at power, the operator is allowed to start the idle pump provided TWO parameters are met. State the parameters AND explain why they must be within procedural limits. (No setpoints required) (2.0)

QUESTION 4.02 (3.00)

a. If pressurizer heaters were lost during a natural circulation cooldown, what are 3 actions or parameters the operator can control, besides minimizing use of aux spray, to maintain the pressurizer bubble as long as possible? (1.5)

b. If auxiliary spray becomes unavailable (during natural circulation cooldown), what are 3 options the operator has for decreasing plant pressure? (1.5)

QUESTION 4.03 (1.50)

The Palisades "Loss of AC Power" procedure cautions the operator not to load the diesel generator in excess of 2100 kw continuously.

a. What is the continuous load rating for the diesel generator? (0.5)

b. Explain what the reasoning is behind this caution. (1.0)

QUESTION 4.04 (.00)

QUESTION DELETED DUE TO HAVING NO ANSWER

QUESTION 4.05 (3.00)

If a reactor trip AND safety injection occurred as a result of a steam generator tube rupture:

a. What are the four radiation monitors that could alarm to indicate a tube leak? (1.2)

b. What are four ways the ruptured steam generator could be identified other than the radiation monitors discussed in part a. above? (0.8)

c. How would the RCS temperature be reduced if the ruptured generator cannot be isolated from the steam header? (Assume the MSIV fails to close on demand and limited release of radioactivity to the secondary is desired) (1.0)

QUESTION 4.06 (1.25)

a. In accordance with GCL 3 (Hot shutdown to critical in hot standby) how much can actual criticality exceed estimated criticality before corrective action must be taken? (0.75)

b. Reactor power must be maintained less than _____% until the above described discrepancy has been resolved. (0.5)

QUESTION 4.07 (1.50)

a. What is the primary dosimetry device used at Palisades to monitor whole body gamma radiation dose? (0.5)

b. The Palisades QUARTERLY dose limit for a 19 year old radiation worker is _____ mrem and the yearly dose limit is _____ mrem not to exceed 5(n-18). (1.0)

QUESTION 4.08 (1.50)

What THREE required immediate actions are performed when a control rod fails to trip upon receiving a reactor trip signal? (1.5)

QUESTION 4.09 (4.30)

a. In accordance with ONP-3 (Loss of Feedwater) there are FOUR automatic actions that can occur upon a loss of feedwater? Explain what causes each action to occur. (2.8)

b. What are your immediate actions if you lose one feedwater pump at approximately 70% power? (3 required) (1.5)

QUESTION 4.10 (2.00)

EOP 8.1 (Loss of Coolant Accident) states that if 50 F subcooling cannot be maintained, assume there have been voids formed in the PCS. What are FOUR indications of substantial void formation? (6 indications possible) (2.0)

QUESTION 4.11 (1.95)

The following concern the Primary Coolant System plant requirements (SOP-1)

a. What required actions must be performed if Pressurizer spray is operated when differential temperature between spray water and Pzr. water is >200 F? (0.95)

b. Is continued operation possible with a RCP main seal and low pressure (vapor) seal failed simultaneously. Explain your answer. (1.0)

QUESTION 4.12 (2.50)

a. Which of the following items are addressed by Technical Specifications? (Answer YES if the item is addressed in the Technical Specifications and NO if it is not.)

1. Source range N.I.'s during startup

2. Safety Injection Tank level

3. Quench tank pressure

4. Startup transformer

5. Plant monitoring computer (Datalogger) (1.5)

b. What are the TWO Palisades Safety Limits? (1.0)

ANSWERS -- PALISADES -81/06/26-STREIER, G.

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ANSWER 1.01 (2.40)

a. MTC becomes MORE NEGATIVE as moderator temperature increases [0.6] because the density change per degree F temperature change of water is greater at higher temperature [0.6]. (1.2)

b. MTC becomes LESS NEGATIVE (at the same moderator temperature) [0.6] because the number of boron atoms (poisons) in the core changes as the density of the water changes such that the negative reactivity effect from a heatup of the moderator is somewhat decreased. [0.6](The moderator temperature coefficient can become positive if the boron concentration is increased sufficiently). (Will also accept discussion on thermal utilization changing Keff, or neutron competition) (1.2)

REFERENCE
C-E Reactor Theory Pgs. 166-168

ANSWER 1.02 (2.00)

Because errors in measurement have less of an effect on the large delta enthalpy as compared to the smaller delta temperature of the primary, [1.5] also the primary flow rate measuring device is relatively inaccurate [0.5]. (2.0)

REFERENCE
General Physics Vol II

ANSWER 1.03 (3.00)

a. ACP LOWER than ECP because the lowering of temperature will insert positive reactivity resulting in criticality at a lower rod height. (1.0)

b. ACP HIGHER than ECP because the higher boron concentration inserts negative reactivity, resulting in a higher rod height. (1.0)

c. ACP LOWER than ECP because xenon concentration will be decreasing which inserts positive reactivity therfore a lower rod height. (1.0)

ANSWERS -- PALISADES -81/06/26-STREIER, G.

REFERENCE
C-E Reactor Theory

ANSWER 1.04 (1.50)

A. Decrease (0.75)
B. Faster (0.75)

REFERENCE
C-E Reactor Theory Pgs. 76-79

ANSWER 1.05 (2.50)

a. SDM is increased [0.5], with power dropping if rods are held constant. (and boron concentration will increase).
[0.5] (Since SDM is the instantaneous amount of reactivity by which the reactor is, or would be subcritical from its present condition). (1.0)

b. 1. Control rod position
2. RCS average temperature
3. Fuel burnup
4. Xenon concentration (Time since shutdown)
5. Power level
(3 @ 0.5 ea) (1.5)

REFERENCE
C-E Reactor Theory

ANSWER 1.06 (2.00)

a. Increase--As center fuel burns up flux shifts to core extremeties. (1.0)
b. Decrease--Boron Conc. increases, absorption in downcomer increases, leakage decreases. (1.0)

REFERENCE
C-E Reactor Theory

ANSWERS -- PALISADES -81/06/26-STREIER, G.

ANSWER 1.07 (2.00)

a. Decrease
b. Increase
c. Increase
d. Decrease [0.5 each] (2.0)

REFERENCE
General Physics Vol II

ANSWER 1.08 (.60)

True. (0.6)

REFERENCE
C-E Reactor Theory Pgs. 159-160

ANSWER 1.09 (2.00)

a. 2 (0.5)

b. 2 (0.5)

c 1 (0.5)

d. 2 (0.5)

REFERENCE
C-E Reactor Theory Pgs. 181-193

ANSWER 1.10 (2.00)

a. 1. Remain the same
2. Decrease
3. Increase
4. Increase
5. Decrease [0.3 each] (1.5)

b. Superheated (0.5)

ANSWERS -- PALISADES -84/06/26-STREIER, G.

REFERENCE
General Physics Vol II

ANSWER 1.11 (3.00)

a. False
b. False
c. True
d. False
e. True
f. False [0.5 each] (3.0)

REFERENCE
General Physics Vol II

ANSWER 1.12 (2.00)

a. Disagree - Tave is a calculated indication and one parameter decreasing will cause Tave to decrease giving a false indication. Agree-If other indication is used in conjunction with Tave. (1.0)

b. Disagree - Natural Circulation is indicated by T h stabilizing then tends to decrease and the T c and T h dT tends to decrease as decay heat decreases. (also accept dT greater than full power dT) (1.0)

REFERENCE
General Physics Vol II

ANSWERS -- PALISADES -81/06/26-STREIER, G.

ANSWER 2.01 (3.00)

a. Establish reverse flow through the core by routing some of the safety injection flow through the charging system cross-connect, auxiliary spray line, pressurizer, hot leg, and into the core. [1.0] This reverse flow will prevent stagnation and precipitation of boric acid in the event of a cold leg break. [0.5] (1.5)

b. After primary system pressure is reduced, the low pressure pumps can be started, and partially open the pump suction valves from the number two hot leg (normally used for shutdown cooling). [1.0] This will ensure sufficient flow through the core in the event of a cold leg break and minimize precipitation. [0.5] (1.5)

NOTE: Credit will be given for--Hot leg injection and normal break flow as one flow path.

REFERENCE
FD-M-30 pgs. 22-23
P&ID M204

ANSWER 2.02 (1.00)

a. false (0.5)

b. false (0.5)

REFERENCE
Student lesson notes #10 pg. 11
Student lesson notes #3 pg. 23

ANSWER 2.03 (3.00)

a. Initially Hydrazine is gravity fed to the Spray pump suction [0.75]. Long term removal is provided by the ability to add NaOH to the spray pump suction [0.75]. (1.5)

b. Solubility of Iodine decreases as temperature of the water increases [0.75], thus removal will be decreased [0.75]. (1.5)

REFERENCE
Student Lesson Notes # 26, pgs. 2&3

ANSWER 2.04 (3.20)

a. 1. The setter is the desired load or speed [0.5]

2. The reference is the actual calculated speed or load or valve position when "Imp out" [0.5] (1.0)

b. 1. Vacuum trip resets

2. Overspeed trip resets

3. Auto stop oil pressure buildup causing various valves to operate. [0.4 each] (1.2)

c. To inform the turning gear system that the rotor is at zero speed so that the gear can be uncoded. (1.0)

REFERENCE
Palisades Exam Bank Phase III week #16

ANSWER 2.05 (2.00)

a. 1. To supply refueling water to the charging pump suction [0.5]
2. To permit makeup to be added to the SIRWT from the CVCS. [0.5] (1.0)

b. In the event that a full core has to be unloaded into the pool or backup to the spent fuel pool cooling system. (1.0)

REFERENCE
Student lesson notes #10 pgs 5&7

ANSWER 2.06 (3.30)

----SEE ATTACHED DRAWING-------

REFERENCE
Aux. Feedwater Plant modification description

ANSWERS -- PALISADES -84/06/26-STREIER, G.

ANSWER 2.07 (3.00)

a. 1. It prevents rapid flashing [0.25] and blowdown of water stored in the secondary side of the S/G. [0.25]
2. To preclude an undesirable rapid cooldown of the reactor [0.5] (1.0)

b. 1. 2 out of 4 [0.2] S/G low pressure signals [0.4] @ 500 psia [0.4]
2. 2 out of 4 [0.2] Containment high pressure signals [0.4] @ 3.7 psi [0.4] (2.0)

REFERENCE
Student lesson notes #18 pgs. 19-21
Student lesson notes #11 pg. 7

ANSWER 2.08 (2.10)

a. Critical service water headers A & B [0.5] by opening normally locked valves [0.2].

b. Aux. feedwater system [0.5] by opening two series valves [0.2]

c. Emergency fill for the spent fuel pool [0.5] by using a swing-elbow [0.2]. (2.1)

REFERENCE
Student lesson notes #34 pg.8

ANSWERS -- PALISADES -84/06/26-STREIER, G.

ANSWER 2.09 (4.20)

a. 1. Windage and ventilation losses [0.4] are reduced because of the low density of the H2 gas [0.4]

2. Increased output per unit volume of active material is secured [0.4] because of the high thermal conductivity and heat transfer coefficients of H2 [0.4].

3. Maintenance expense is reduced [0.4] because of the freedom from dirt and moisture in the closed recirculating gas system [0.4].

4. Life of the insulation on the stator winding may be increased [0.4] because of the absence of oxygen and moisture [0.4].

5. Windage noise is reduced [0.4] because of the lower density of the gas and the closed ventilating system [0.4]
[any four required] (3.2)

b. 1. The steam vaporizer is used to convert liquid CO2 to gas [0.5]

2. The electrical gas heater increases the CO2 gas temperature from zero to 60 F [0.5] (1.0)

REFERENCE
Student lesson notes #31 pgs. 11&15

ANSWERS -- PALISADES -84/06/26-STREIER, C.

ANSWER 3.01 (3.70)

a. Anyone of the preferred AC busses can be powered through the BYPASS REGULATOR. [0.8] With normal line up, power would come from bus No. 1C, MCC No. 1 would be supplied from 480 V bus No. 11 and in turn supply the 120 VAC instrument DC bus. The instrument AC bus would supply the bypass regulator. [1.0] (1.8)

b. The normal perturbations experienced during the loss of an instrument bus; this operation requires a 'dead' transfer. However if the SIAS had been blocked, loss of power to one bus could reset the blocked signal when power was regained [1.0] Hold SIAS block to mitigate the problem [0.9] (1.9)

REFERENCE
FD-E-05 Sect. 3.2
P&ID WD 950

ANSWER 3.02 (4.10)

a. The valves will fail as is [0.4]. The actuator has two air inputs [0.4] each containing a solenoid which actuates to close on decreasing air pressure [0.4]. This "trips" the valve in it's as-is position [0.4]. (1.6)

b. 1. High S/G level will shut the FWRV.[0.5]
2. Low S/G pressure will shut the FWRV [0.5]
3. Turbine trip locks FWRV as is, feed pumps ramp down [0.5] (1.5)

c. The high signal select circuit receives a feedwater demand signal from each S/G controller, then selects the highest input and sends to control feed pump speed. (1.0)

REFERENCE
Student lesson notes #17, pgs. 3&11

ANSWERS -- PALISADES -84/06/26-STREIER, G.

ANSWER 3.03 (1.50)

a. Advises the operator to arm the system when PCS temperature drops below 300 F. [0.5]

b. Advises the operator of an approaching high pressure condition when the PCS is solid. [0.5]

c. Advises the operator that pressure has increased (to 375 psia) and the PORV's have opened. [0.5] (1.5)

REFERENCE
Student lesson notes #5 pg 25

ANSWER 3.04 (3.50)

a. The atmospheric dumps will not open because the turbine is not tripped [0.75]. The steam bypass valves will modulate to control steam pressure at 900 psia [0.75]. (1.5)

b. When Tave > 557 F [0.5] the RRS will supply a quick-opening signal to open the steam dump and bypass valves rapidly [0.5]. When Tave drops below 557 F the quick-open signal clears [0.5]. As temperature decreases the valves will modulate shut until they are completely shut at 545 F with exception of the bypass valves which will modulate to control 900 psia/535 F [0.5] (2.0)

REFERENCE
Student lesson notes #18 pgs. 8-11

ANSWER 3.05 (2.50)

a. By using the two techniques in one channel, a d-c signal proportional to the log of neutron flux over approximately 10 decades is obtained. (1.0)

b. The output of square law detection of the A-C portion of a random pulse signal is proportional to the pulse rate. (1.5)

REFERENCE
Student lesson notes #11 pg. 9

ANSWER 3.06 (3.00)

a. Increase [0.5]--increased neutron leakage to detector [0.5] (1.0)

b. Increase [0.5]--reduced density of water in reference leg decreases differential pressur signal resulting in an apparent increase in level [0.5] (1.0)

c. Increase [0.5]--feed flow would increase to attempt to match the steam flow intil the level error signal overrides the mismatch and reduces flow. [0.5] (1.0)

ANSWER 3.07 (1.20)

a. Startup transformer low voltage [0.6]

b. Station power transformer incoming breakers tripped on overcurrent. [0.6] (1.2)

REFERENCE
Student lesson notes #33 pg. 7

ANSWER 3.08 (3.50)

a. 1. Primary pressure
2. Tc
3. Th
4. Thermal power [0.4 each] (1.6)

b. 1. High power rate of change pretrip [0.5]
2. High power auxiliary pretrip [0.5] (1.0)

c. Due to the CRDM rundown feature. (0.9)

REFERENCE
Student lesson notes #14 pgs. 14&21
Tech. Spec. 2.3

ANSWERS -- PALISADES -84/06/26-STREIER, C.

ANSWER 3.09 (2.00)

a. 1. Backup heaters off
   2. close #3 orifice stop valve
   3. close #2 orifice stop valve [0.4 each] (1.2)

b. 1. #3 charging pump stops
   2. #2 charging pump stops [0.4 each] (0.8)

REFERENCE
PZR. level control system description pg. 16

ANSWERS -- PALISADES -81/06/26-STREIER, G.

ANSWER 4.01 (2.00)

Power limition is [20%][0.5]. Temperature limitation: Delta-t between operating and non-operating [10 deg.][0.5]. The reason is the addition of reactivity due to colder water may cause a power excursion beyond the 3 pump trip setpoint[1.0]. (2.0)

REFERENCE
SOP, 1, P. 27

ANSWER 4.02 (3.00)

a. 1. Minimize pressurizer level fluctuations.
2. Stop all pressurizer sampling.
3. Stop pressurizer de-gassing.
4. Maintain PCS cooldown rate greater than PZR. cooldown rate.
5. Control letdown flow
6. Control charging flow [any 3, 0.5 each] (1.5)

b. 1. Pressurizer fill and drain method.
2. Ambient heat losses.
3. Operate pressurizer PORV'S.
4. Pzr. vapor space vent
5. Vapor sample line [any 3, 0.5 each] (1.5)

REFERENCE
ONP, 21, Pg. 4,5 5

ANSWER 4.03 (1.50)

a. 2500 KW (0.5)

b. It is desired to have 100 KW [0.5] less than full load to accomodate any autoloading equipment and prevent jeopardizing continued operations of the diesel [0.5]. (1.0)

REFERENCE
EOP-2 4.1.1

ANSWER 4.04 (.00)

ANSWER DELELTED

ANSWERS -- PALISADES -84/06/26-STREIER, G.

REFERENCE
EOP-1 Section 2

ANSWER 4.05 (3.00)

a. 1. Steam generator blowdown monitor alarm
2. Condenser off-gas monitor alarm
3. Waste gas monitor alarm
4. Stack gas monitor alarm
5. Penetration and fan room area monitor alarm
[any four @ 0.3 each] (1.2)

b. 1. Steam generator sample
2. Steam line survey
3. Unexpected rise in S/G level
4. Steam flow > feed flow [0.2 each] (0.8)

c. Close non-ruptured S/G MSIV and bypass valve. Use the atmospheric dump on non-ruptured S/G for steam dump. (1.0)

REFERENCE
EOP 8.2

ANSWER 4.06 (1.25)

a. .0075 (0.75)

b. 10 -4% (0.5)

REFERENCE
GCL 3 pg. 4

ANSWER 4.07 (1.50)

a. TLD (0.5)

b. 3000 mrem, 5000 mrem (1.0)

REFERENCE
Admin Procedure #7.04 pgs. 3-5

ANSWERS -- PALISADES -84/06/26-STREIER, G.

ANSWER 4.08 (1.50)

1. Depress the backup manual trip button on RPS panel C06 [0.5]

2. If complete reactor trip is not evident, initiate emergency boration. Borate 225 ppm per struck rod or borate to cold shutdown. [0.3]

3. Activate Site Emergency Plan if necessary. [0.5] (1.5)

REFERENCE
ONP 7 pg. 1

ANSWER 4.09 (4.30)

a. 1. Low feedwater suction pressure (270 psig) [0.3] will open full heater drain pump capacity to the feedwater pump suction [0.4].

2. Low feedwater suction pressure (250 psig) [0.3] trips both feedwater pump turbines [0.4]

3. Reactor trip [0.4] on S/G low level (25.7%) [0.3]

4. Auto auxiliary FW initiation [0.4] on S/G low level (28.7%) [0.3] (2.8)

b. 1. Increase speed of operating feed pump to restore S/G level.

2. Reduce turbine and reactor power level at the maximum rate to below 60%.

3. Trip the reactor and turbine if S/G level cannot be maintained above the low level pre-trip alarm. (1.5)

REFERENCE
ONP-3 pg. 1

ANSWERS -- PALISADES -84/06/26-STREIER, D.

ANSWER 4.10 (2.00)

a. Core outlet temperature readings higher than saturation conditions.
b. Increased core dT above full power (47 F)
c. Startup neutron detectors showing erratic indication
d. Incore thermocouples showing erratic indication
e. Th increasing or erratic
f. Tc erratic [four required @ 0.5 each] (2.0)

REFERENCE
EOP 8.1 pgs. 3&4

ANSWER 4.11 (1.95)

a. Log time, differential temperature, and Przr. pressure in the reactor log book. (0.95)

b. Yes [0.5], if additional leakage is within limitations of the radwaste system.[0.5] (1.0)

REFERENCE
SOP-1 pgs. 2&3

ANSWER 4.12 (2.50)

a. 1. yes
2. yes
3. no
4. yes
5. yes [0.3 each] (1.5)

b. 1. Reactor power level shall not exceed the allowable limit for Przr. pressure and cold leg temperature [T.S. figure 2-3]. [0.5]

2. Primary pressure shall not exceed 2750 psia with fuel in the Reactor vessel. [0.5] (1.0)

ANSWERS -- PALISADES -84/06/26-STREIER, C.

REFERENCE
Palisades Tech. Specs.

Master

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

FACILITY: Palisades
REACTOR TYPE: CE PWR
DATE ADMINISTERED: June 26, 1984
EXAMINER: R. L. Higgins
APPLICANT:

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%.

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

Final Grade _____%

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

_____
Applicant's Signature

5.1 a. How are the terms "condenser vacuum" and "condenser backpressure" related? (1.0)

b. What backpressure limit has been established? (0.5)

c. Whose permission is required to exceed this limit? (0.5)

5.2 Why, if turbine flooding occurs, is the turbine not manually tripped unless turbine vibration exceeds 14 mils? (1.0)

5.3 If the specific activity of the primary coolant exceeds certain limits the reactor must be shutdown and Tavg reduced below 500°F within 6 hours. Explain the basis for reducing Tavg below 500°F. (2.0)

5.4 What is the basis for establishing a maximum primary to secondary differential pressure limit? (1.0)

5.5 a. What is RT_{NDT}? (1.0)

b. Why is the RT_{NDT} shift greater at 1/4 thickness through the reactor vessel wall than it is at 3/4 thickness through the reactor vessel wall? (2.0)

5.6 Why must the hydrogen concentration be reduced to less than 5 cc/kg prior to opening the primary coolant system? (1.0)

5.7 Calculate the length of time for power to rise from the power level at which the reactor is considered critical for administrative control until the lowest power level at which the reactor is in the power operation condition. Assume that the maximum permissible sustained startup rate is maintained the entire time. (3.0)

5.8 a. What is the minimum temperature for criticality for normal operation? (0.5)

b. Explain the basis for establishing a minimum temperature for criticality. (1.5)

5.9 What is meant by the term "divergent azimuthal xenon oscillations?" (2.0)

5.10 a. What are the three reasons (bases) listed in Tech Specs for establishing control rod regulating group insertion limits? (1.5)

b. When, if ever, is it permissible to violate the control rod regulating group insertion limits? (1.0)

5.11 Why is samarium ignored in the shutdown margin equation? (1.0)

5.12 a. Define the term "Quadrant Power Tilt." (1.0)

b. What is the maximum value for "Quadrant Power Tilt" for which no corrective action is required, and when is this limit applicable? (1.0)

5.13 Tritium is addressed separately in Tech Specs.

a. Give two reasons for the extra concern shown for tritium. (1.0)

b. Name three different ways that tritium can be produced. (1.5)

6.1 What signals will cause the automatic closure of the Component Cooling Water Containment Isolation Valves? (1.0)

6.2 a. What are the backup water supply sources for the Auxiliary Feedwater System? (1.0)

b. Explain how the FOGG system functions. (2.0)

6.3 A reactor trip will de-energize the electromagnetic clutch, allowing the rod to drop due to its own weight. In case the rod does not drop, the motor can push the rod down. How can the motor push the rod down if the electromagnetic clutch is de-energized? (1.0)

6.4 a. Other than the pressurizer safety valves and PORVs, what other relief valves relieve to the Quench Tank? (1.5)

b. What two interlocks are associated with CV-0155, the air-operated valve in the primary water supply line to the Quench Tank? (1.0)

6.5 a. What signal is used to generate the pressurizer level setpoint? (0.5)

b. What automatic actions will occur as pressurizer level increases from its setpoint value up to a level of 90%? (1.5)

6.6 a. Explain the difference between the primary and redundant Boric Acid Tank Heater and Pipe Heat Tracing circuits and how the two circuits function to maintain temperature. (2.0)

b. What action must be taken if temperature of the boric acid solution drops below the precipitation temperature? (1.0)

6.7 a. Describe how the shutdown cooling system can be used for fuel pool cooling. (1.5)

b. What system provides a backup source of water for the fuel pool? (0.5)

6.8 Name three functions which can be controlled from the Remote Shutdown Control Panel. (1.5)

6.9 a. How is SI precluded during normal shutdown? (1.0)

b. What maintains the SIRWT temperature above 40°F? (1.0)

6.10 Briefly describe how the incore neutron detectors detect neutrons. (2.0)

6.11 Why does the wide range logarithmic detection circuit employ Campbelling at high power but not at low power? (1.0)

6.12 Briefly discuss the operation of the ground detection circuit used in the matrix relays. Include the normal and grounded conditions. (2.0)

6.13 What four abnormalities will cause a trip of an emergency diesel generator? (2.0)

7.1 a. What is the abnormal operating limit for the differential temperature between the spray water and the pressurizer water, and when, if ever, can this limit be exceeded? (1.0)

b. What action must be taken if the differential temperature between the spray water and pressurizer water exceeds 200°F? (1.0)

7.2 What action must be taken if Charging Pump Seal leakage exceeds 1200 ml/min, and what is the basis for this action? (2.0)

7.3 What is the reason for manually starting one diesel generator prior to latching and rolling the main turbine? (1.0)

7.4 Why must the service water supply valves CV-0879 and CV-0880 and service water return valve CV-0951 for the engineered safeguards pumps not be opened at the same time that the component cooling water supply valve CV-0913 and return valve CV-0950 for the engineered safeguards pumps are open? (1.0)

7.5 a. What is meant by the term "minimum critical assembly?" (1.0)

b. What is the minimum critical assembly value for Palisades? (0.5)

7.6 a. "By commitment to the NRC, no load greater than _____ shall be handled over the spent fuel pool when it contains irradiated fuel which has less than 12 months' decay time unless it is moved per an approved procedure." (0.5)

b. What action must be taken if the cable slack light comes on with "Lower Grapple Operate Zone" light off while inserting a fuel assembly into the core? (1.0)

7.7 Explain the actions which must be taken if a PCP experiences a multiple seal failure. (3.0)

7.8 List the seven immediate actions which must be taken if a reactor trip occurs accompanied by a safety injection. (3.5)

7.9 If an SIS signal is received or primary pressure drops below a certain value after a Loss of AC power occurs, operators must take certain action.

a. What is that action? (1.0)

b. What is the value of primary pressure at which this action must be taken? (0.5)

c. Why is this action necessary? (1.0)

7.10 Name the 3 situations specified in the Loss of Component Cooling procedure which require that the reactor be tripped. (1.5)

7.11 What five indications are used to confirm natural circulation flow? (2.5)

7.12 What is a Seiche? (1.0)

7.13 What is the limitation on amperage supplied to the Motor Driven Auxiliary Feedwater Pumps? (1.0)

7.14 What two immediate actions must be taken if a control room evacuation is required when the reactor is at power? (1.0)

8.1 a. What is the maximum recommended power escalation rate when power exceeds 90%? (0.5)

b. (1) What is the maximum load permitted when any two stages of feedwater heaters are bypassed? (0.5)

(2) Why is this load restriction imposed? (1.0)

c. What action must be taken if the maximum ice limits for the Palisades switchyard lines are exceeded? (1.5)

8.2 If the specific activity of the primary coolant exceeds certain limits the reactor must be shutdown and Tavg reduced below 500°F within 6 hours. What are those specific activity limits? Define all terms. (3.0)

8.3 What Tech Spec safety limit is in effect when the plant is in Hot Shutdown? (1.0)

8.4 Explain what is wrong with the following statements:

a. If an individual discovers radioactive fluid leaking from a plant system, he should as quickly as possible shut system valves in an attempt to isolate the leak. (1.0)

b. The standard RWP can be issued for a maximum of six months. (1.0)

c. Only the Radiation Safety Supervisor may authorize entry without an RWP when immediate action is required. (1.0)

8.5 What does a circle R in a work procedure mean? (1.0)

8.6 What actions must you take if the following circumstances occur:

a. You plan to undergo radiotherapy in the near future. (1.0)

b. You lose your dosimeter while in a radiation area. (1.0)

8.7 Whose permission is required to exceed the 2500 mrem per quarter whole body exposure control level? (1.0)

8.8 Whose approval must the shift supervisor obtain to take the reactor critical following a trip from 1% or greater power? Assume that the cause of the trip has been determined and corrected. (1.0)

8.9 Which individual on shift is directly responsible for the following activities.

a. Preparing a Reactor trip report. (0.5)

b. Ensuring the shift is properly manned. (0.5)

c. Identifying specific operator weaknesses which could be corrected through new or improved training. (0.5)

d. Declaring equipment operable or inoperable. (0.5)

e. Maintaining the Jumper, Link, and Bypass Log. (0.5)

8.10 a. How does an operator performing a System Checklist verify the position of a sealed valve which has an intact (unbroken) seal? (1.0)

b. System Checklists for plant startup shall be invalid unless the system is placed in operation within _____ after completion of the System Checklist. (0.5)

8.11 a. Each bypass authorized in the Jumper, Link, and Bypass Control Log shall be identified by placement of a _____. (0.5)

b. What is the purpose of CPIT stickers? (0.5)

8.12 a. When does the Temporary EOF assume the functions of the General Office Emergency Control Center? (0.5)

b. Name two locations which can be used as an alternate TSC in the event the normal TSC becomes uninhabitable. (1.0)

c. What organization provides offsite backup firefighting support for the Palisades Plant? (0.5)

8.13 Three decisions which the Site Emergency Director is responsible for making may not be delegated by him to another individual. Name those three decisions. (1.5)

8.14 What is the minimum number of the following components which must be operable in order to bring the reactor critical.

a. Secondary system safety valves (.25)

b. Safety Injection tanks (.25)

c. High pressure safety injection pumps (.25)

d. Boric acid tank level (.25)

$f = ma$

$w = mg$

$E = mc^2$

$KE = 1/2\ mv^2$

$PE = mgn$

$V_f = V_o + at$

$W = v\ \Delta P$

$\Delta E = 931\ \Delta m$

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

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

$Pwr = W_f \Delta h$

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

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

$SUR = 26.06/T$

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

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

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

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

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

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

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

$\Sigma = \sigma N$

$v = s/t$

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

$a = (V_f - V_o)/t$

$w = \theta/t$

Cycle efficiency = (Network out)/(Energy in)

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

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

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

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

$I = I_o e^{-ux}$

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

$TVL = 1.3/u$

$HVL = -0.693/u$

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

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

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

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

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

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

$\ell^* = 10^{-5}$ seconds

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

$I_1 d_1 = I_2 d_2$

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

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

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

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 $lbf/in.^2$

Miscellaneous Conversions

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

Master

ANSWERS

5.1. a. Condenser vacuum plus condenser backpressure equal atmospheric pressure. (1.0)

b. 4.3 inches of mercury. (0.5)

c. Specific written permission of the Plant Superintendent, Operations/Maintenance Superintendent, or Operations Supervisor. (0.5)

Ref: Standing Order No. 16

5.2 Either of the following answers will be awarded full credit:

Considerable damage can occur as the turbine passes through the critical speeds (0.5) due to rubs which become progressively worse as the effect of the localized heating at the point of contact occurs. (0.5)

or

After the turbine has come to rest, the water from the heater will lay in the bottom of the turbine shell resulting in faster cooling of the bottom half than the top. (0.5) This results in a warped stator. (0.5)

Ref: Standing Order No. 18

5.3 Prevents the release of activity if a steam generator tube rupture occurs (1.0) since the saturation pressure of the primary coolant is below the lift pressure of the atmospheric steam relief valves. (1.0)

Ref: Tech Spec p. 3-18

5.4 Maintain the differential pressure below a value which would cause tube rupture. (1.0)

Ref: Tech Spec p. 3-2

5.5 a. RT_{NDT} is the reference transition nil ductility temperature (0.5), the temperature below which a material's failure mode will change from a ductile one to a brittle one. (0.5)

b. The RT_{NDT} shifts due to neutron embrittlement (0.5), the embrittlement of the metal due to the deformation of the metal lattice by high energy neutrons. (0.5) The high energy neutron fluence is lower at 3/4 than it is at 1/4 due to the shielding of the reactor vessel walls (0.5), so the neutron embrittlement is greater at 1/4 than it is at 3/4. (0.5)

5.6 Hydrogen solubility is directly proportional to pressure. As pressure drops, hydrogen solubility will decrease markedly. (0.5) If hydrogen concentration is not reduced, hydrogen will escape from the primary coolant when the primary coolant system is opened creating a potential for an explosion. (0.5)

Ref: SOP 1 Step 7.1.5

5.7 $P = P_0\ 10^{SUR \times \text{time in minutes}}$ (0.5)
$P/P_0 = 10^{SUR \times \text{time in minutes}}$ (0.1)
$\log_{10} P/P_0 = SUR \times \text{time in minutes}$ (0.1)
$P = 2\%$ (0.5)
$P_0 = 10^{-4}\%$ (0.5)
SUR = 1 decade per minute (0.5)
$P/P_0 = 2/10^{-4} = 2 \times 10^4$ (0.1)
$\log_{10} (2 \times 10^4) = 4.301$ (0.5)
$4.301 = 1\ DPM \times \text{time in minutes}$ (0.1)
time = 4.3 minutes (0.1)

Ref: Tech Spec p. 1-1; GOP 3 Step 2.3.5

5.8 a. 525°F (0.5)

b. The moderator coefficient at lower temperature will be less negative or more positive than at operating temperature. (0.5) Restricting reactor operation when primary coolant temperatures are less than the minimum temperature for criticality will reduce the maximum potential reactivity insertion that could result from a primary coolant system depressurization. (1.0)

Ref: Tech Specs p. 3-12, 13

5.9 An azimuthal xenon oscillation is the alternating increase in xenon concentration and decrease in power in one longitudinal end of the core while a corresponding decrease in xenon concentration and increase in power occurs in the other longitudinal end of the core. (1.0) Divergent means the cycles of buildup and depletion of xenon get larger in magnitude over time. (1.0)

Ref: Tech Specs p. 3-68

5.10 a. Ensure shutdown margin limits are satisfied. (0.5)
Limit individual rod worth. (0.5)
Limit hot channel factors. (0.5)

Ref: Tech Specs p. 3-60

b. When it is necessary to rapidly reduce power to avoid or minimize a situation harmful to plant personnel or equipment. (1.0)

Ref: Tech Specs 3-63

5.11 Samarium concentration will only become greater after a trip since it is only removed by neutron absorption. (1.0)

or

Plutonium 239 production due to the decay of Neptunium 239 offsets the effect of samarium buildup. (1.0)

Ref: Phase I Comprehensive Examination, question 9.b.

5.12 a. The difference between nuclear power in any core quadrant and the average in all quadrants. (1.0)

Ref: Tech Specs p. 1-2

b. Quadrant power tilt shall not exceed 5%. (0.5)
This limit is applicable when power is above 50%. (0.5)

Ref: Tech Specs p. 3-112

5.13 a. Any two of the following.

1. Tritium emits a low-energy beta and is hard to detect. (0.5)
2. Tritium has a 12 year half life. (0.5)
3. Tritium can diffuse through metal. (0.5)
4. Tritium is an isotope of hydrogen, so it can not be filtered or chemically removed. (0.5)
5. Tritium can easily enter a human's body. (0.5)

b. Any three of the following.

1. Ternary fission (0.5)
2. Neutron activation of deuterium (0.5)
3. Lithium 6 plus a neutron (to give tritium and an alpha) (0.5)
4. Lithium 7 plus a neutron (to give tritium, a neutron, and an alpha) (0.5)
5. Boron 10 plus a neutron (to give tritium and two alphas) (0.5)
6. Boron 11 plus a neutron (to give tritium, a neutron, and two alphas) (0.5)

Ref: Tech Specs p. 6-22

ANSWERS

6.1 An SIAS (0.5) and CCW pressure of 60 psig (0.5)

Ref: Plant Modifications-Component Cooling Water Containment Isolation Valves

6.2 a. Fire protection system for all AFW pumps. (0.5)
Service Water system for P-8C. (0.5)

Ref: Plant Modifications - Auxiliary Feedwater System, p. 1

b. The FOGG system, Feed Only Good Generator (0.5), will shut motor operated valves in the AFW supply lines to the steam generator (0.5) which has a level less than 447 inches above the bottom of the steam generator support skirt (0.5) and concurrently has a pressure which is more than 150 psi less than the pressure in the other steam generator. (0.5)

~~447 and 150~~ ~~valves~~

equivalent to 28.7%

Ref: Plant Modifications - Auxiliary Feedwater System, p. 5

6.3 By driving through the antireverse clutch. (1.0)

Ref: System Description No. 2, p. 7

6.4 a. Shutdown cooling relief (0.5)
SI tanks drain relief (0.5)
~~Shutdown cooling~~ relief (0.5)

letdown line

Ref: M-201 sheet 3

b. CV-0155 can not be opened if a containment high pressure (0.5) or a containment high radiation signal is present. (0.5)

Ref: System Description Number 8, p. 8

6.5 a. Average primary coolant temperature (0.~~4~~5) from the loop associated with the reactor regulator system being used for control. ~~(0.1)~~

Ref: System Lesson Notes Number 5, p. 12

b.

+2.3% (+6")	~~(0.1)~~	Open #2 orifice stop valve	(.5)	(~~.15~~)
+2.7% (+7")	~~(0.1)~~	Minimum Chg Pump capacity	(.5)	(~~.15~~)
+4.6% (12")	~~(0.1)~~	Open #3 orifice stop valve	(.5)	(~~.15~~)
		Energize Backup heaters		(~~.15~~)
Backup Volume Control Signal	~~(0.1)~~	Stop #2 and #3 Chg Pumps		(~~.15~~)
		Open #2 and #3 orifice stop-valves		
+5.78% (15")	(0.1)	High level error alarm actuates		(~~0.1~~)

backup heaters are always energized during power ops

setpoints not req'd by the question

Ref: System Lesson Notes Number 5, p. 16

6.6 a. The primary heat tracing circuit will energize at a higher temperature than the redundant circuit. (1.0)

As the temperature of the solution drops, the primary circuit will energize first. (0.5) If the heat capacity of the primary circuit is inadequate, the temperature will continue to drop, causing a primary low temperature alarm and energizing the redundant circuit. (0.5)

b. The system should be flushed or drained (0.5) to prevent blockage of the component by boric acid crystals. (0.5)

Ref: System Lesson Notes No. 7, p. 15 ; Tech Spec pg 3-26, 27, 28

6.7 a. A temporary connection is made (~~0.5~~ 1.0) (to provide for additional heat removal or to provide a backup capability for the fuel pool heat exchangers.) (~~0.5~~) The SDCS would be aligned with one heat exchanger train lined up to the fuel pool cooling system and the other SDCS heat exchanger lined up for cooling the PCS. (0.5)

Ref: System Lesson Notes No. 9, p. 13, 16

b. The fire protection system. (0.5)

Ref: System Lesson Notes No. 40, p. 4

6.8 Any three of the following:

1. boration of the PCS to cold shutdown concentration (0.5)
2. control of steam generator levels (0.5)
3. cooldown of the PCS (0.5)
4. establishment of boron concentration in the shutdown cooling system equal to or greater than that in the PCS (0.5)
5. heatup of shutdown cooling system (0.5)

Ref: System Lesson Notes No. 42, p. 2 or functions noted in page 1

6.9 a. Manually blocked (0.5) when 3 of 4 pressurizer pressure sensors indicate 1690 psia. (0.5)

Ref: System Lesson Notes No. 10, p. 30; GLC 9, Step 2.9

b. Heating Steam is supplied to SIRWT heat exchanger E-57. (0.5) SIRWT recirc pump recircs SIRWT water through the heat exchanger. (0.5)

Ref: System Lesson Notes No. 10, p. 8; M204 F-2

6.8 1. monitor engineered safeguards systems (0.5)
2. isolate failed static components and activate redundant static components (0.5)
3. control shutdown systems and ~~the~~ core and systems (0.5)
4. monitor the primary system to perform hot shutdown and cold shutdown without access to the control room (0.5)

6.10 The incore detectors contain rhodium. As the central wire of a coaxial detector (0.5) rhodium interacts with a thermal neutron to produce a beta. (0.5) The betas are electrons, so they produce a signal which is directly proportional to the number of betas produced (0.5) which is in turn directly proportional to the thermal neutron flux. (0.5)

Ref: System Lesson Notes No. 11, p. 14

6.11 At high power, neutrons are creating pulses so rapidly that the pulses overlap, so that conventional pulse-type counting would be in error. (0.5)

Campbelling requires that the pulses overlap so that Campbelling can not be used at low power. (0.5)

Ref: CE Nuclear Instrumentation Notes, p. 17

6.12 The indicator light connected across each matrix relay coil consists of two lights in series with a center ground point. (0.5)

During normal operation, with no ground in the circuit, the two lights in series will provide minimum illumination of the top half of a split screen indicator light, to indicate normal potential across each matrix relay coil. (0.5)

If a ground fault occurs, one set of lights will be shorted to ground and go off. (0.5) The other set of lights, however, will be connected across virtually the full 28 V d-c of the matrix power supply and will be brightly illuminated. (0.5)

Ref: System Lesson Notes No. 14, p. 8

6.13 1. Generator differential relay action (0.5)
2. Engine overspeed (0.5)
3. Failure to start (overcrank) (0.5)
4. Low bearing oil pressure (0.5)

Ref: System Lesson Notes No. 33, p. 15

ANSWERS

7.1 a. 350°F (0.5)
During an emergency situation. (0.5)

b. Log the time (.25), differential temperature (.25) and pressurizer pressure (.25) in the Reactor Logbook (.25).

Ref: SOP 1, Step 4.0.m

7.2 1. Stop the Charging Pump (0.5) and isolate it. (0.5)
2. Packing failure can occur. (1.0)

Ref: SOP 2A Step 5.0.i

7.3 Provide power to the lube oil system (0.5) if outside power is lost during turbine startup. (0.5)

Ref: GLC 4, Step 2.5; SOP 8, Step 2.0.2.b

7.4 To prevent pumping the contents of the component cooling system directly to the lake. (1.0)

Ref: SOP 15, Step 5.0; SOP 16, Step 7.6

7.5 a. The minimum number of fuel elements required for a criticality to occur (0.5), assuming optimal moderation and geometry (0.5).

b. 3 bundles (0.5)

Ref: SOP 28, Step 4.9

7.6 a. The weight of a fuel bundle. (0.5)

b. Hoist shall be raised until the fuel assembly just begins to lift and attempt to reengage. (1.0)

Ref: SOP 28, Step 4.16, 5.15

7.7 1. Conduct an orderly plant shutdown (in accordance with GOP 8) (.75), keeping the affected pump running. (.75)

2. Initiate plant cooldown (in accordance with GOP 9). (.75) When the step (in GOP 9) is reached calling for the stopping of 2 PCPs - stop the affected pump and another in the opposite loop <u>not</u> connected to the pressurizer spray line. (.75)

Ref: Standing Order No. 32

7.8 1. Insure the Full Length Control Rods are indicating fully inserted and that reactor power is decreasing. (0.5)

2. Verify turbine trip and generator breakers opened; manually trip the turbine, then generator, if necessary. (0.5)

3. Verify both Emergency Diesel Generators have started. (0.5)

4. Trip one Main Feed Pump if both are running. (0.5)

5. Trip the other Main Feed Pump as Tavg nears 525°F. (0.5)

6. Trip all PCPs after insuring that the Reactor has been tripped for more than 5 seconds. (0.5)

7. Insure and/or establish Auxiliary Feedwater flow to restore normal level in the Steam Generators. (0.5)

Ref: EOP 1, Step 3.0

7.9 a. Start minimum operating safety injection equipment by placing the Normal Shutdown Sequencer Switches to the Test position (0.5) and holding them for 45 seconds (until the DBA sequencers time out). (0.5)

recent mod has made this unnecessary

b. 1605 psia (0.5)

c. Must manually energize the DBA sequencer so that the DBA loads will sequence on to the bus. (1.0)

Ref: EOP 2, Step 4.1

7.10 1. Primary Coolant Pump seal bleed off temperature exceeds 185°F. (0.5)

2. Primary Coolant Pump bearing temperature exceeds 175°F. (0.5)

3. All (or most) Control Rod drives seal leak-off temperatures exceed 200°F. (0.5)

Ref: EOP 4, Step 4.1

7.11 (a) Loop ΔT ($T_h - T_c$) less than normal full power ΔT (47°F). (0.5)

(b) Cold leg temperatures constant or decreasing. (0.5)

(c) Hot leg temperatures stable (i.e., not steadily increasing). (0.5)

(d) No abnormal differences between hot leg RTDs and core exit thermocouples. (Do not depend on a single indication. Use several thermocouples and all RTDs.) (0.5)

(e) Steam Generator levels are $\geq$ -84%* (on wide range Steam Generator level instruments). (0.5)

*NOTE: The desired level indication will change with system temperature and pressure.

Ref: ONP 21, Step 4.0 (3)

7.12 An oscillation of the surface of a lake possibly causing flooding. (1.0)

Ref: ONP 12

7.13 112 amps on P-8A (0.5)
93 amps on P-8C (0.5)

Ref: EOP 1, Step 3.6

7.14 1. Trip the reactor. (0.5)
2. Trip both Main Feed Pumps. (0.5)

Ref: EOP 10, Step 3.0

ANSWERS

8.1 a. 1%/hr (0.5)

Ref: Standing Order No. 8

b. (1) 600 MWe (0.5)
(2) Prevent excessive extraction steam velocity in the next high pressure heater. (1.0)

Ref: Standing Order No. 14

c. (1) The Plant General Manager or Duty and Call Superintendent shall be notified of the existing condition. (0.5)

(2) Power Control shall be informed of the existing condition. (0.5)

(3) Commence plant shutdown to hot standby. (0.5)

Ref: Standing Order No. 22

8.2 1. Greater than 100/E microcuries per gram (0.5)
E is the weighted average of the beta and gamma energies per disintegration (in MEV) (0.5) for isotopes, other than iodines, with half lives greater than 15 minutes, making up at least 95% of the total noniodine activity in the coolant (0.5)

2. Greater than 1.0 microcurie per gram dose equivalent I-131 for more than 72 hours during one consecutive time interval (0.5) or greater than 40 microcuries per gram dose equivalent I-131 (0.5)
Dose equivalent I-131 is the concentration of I-131 which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. (0.5)

Ref: Tech Specs p. 1-4, 3-17

8.3 PCS pressure shall not exceed 2750 psia when there are fuel assemblies in the reactor vessel. (1.0)

Ref: Tech Specs p. 2-3

8.4 a. Shutting system valves indiscriminately may result in much more severe damage to equipment or the disabling of safety systems. (1.0)

Ref: Admin Procedure 7.00 Step 2.0.a.2

b. The standard RWP is issued for a maximum period of seven days. (1.0)

Ref: Admin Procedure 7.03 Step 5.2.a

c. The Shift Supervisor may also authorize entry without an RWP when immediate action is required. (1.0)

Ref: Admin Procedure 7.03 Step 5.3

8.5 Radiation Safety hold point (1.0)

Ref: Admin Procedure 7.03 Step 7.2.h

8.6 a. Notify Radiation Safety. (1.0)

b. Leave the radiation area (0.5) and report to Radiation Safety personnel. (0.5)

Ref: Admin Procedures 7.04 Step 4.4

8.7 Chemistry and Health Physics Superintendent (0.5), and Plant General Manager. (0.5)

Ref: Admin Procedure 7.04, Table 1

8.8 Either of the following is correct:

Duty and Call Superintendent (1.0) or Plant Manager (1.0)

Ref: Admin Procedure 4.01 Step 5.9.e

8.9 a. Shift Engineer (0.5)

Ref: Admin Procedure 4.01 Step 6.6

b. Shift Supervisor (0.5)

Ref: Admin Procedure 4.01 Step 4.4.b

c. Shift Engineer (0.5)

Ref: Admin Procedure 4.01 Step 6.7

d. Shift Supervisor (0.5)

Ref: Admin Procedure 4.01 Step 4.4.e

e. Control Operator 1 (0.5)

Ref: Admin Procedure 4.03 Step 9.2

8.10 a. By visual verification of the valve's stem or other components which would indicate the valve to be in the proper position. (1.0)

Ref: Admin Procedure 4.02 Step 7.2.3.e

b. Ten days (0.5)

Ref: Admin Procedure 4.02 Step 7.2.5

8.11 a. Caution Tag (0.5)

Ref: Admin Procedure 4.03 Step 9.2

b. Identify defective components on control panels. (0.5)

Ref: Admin Procedure 4.03 Step 11.0

8.12 a. When the permanent EOF is activated. (0.5)

Ref: Site Emergency Plan, p. 7-2

b. Any two of the following:

OSC (0.5)
Feedwater Purity Building (0.5)
On-site Training Building (0.5)

Ref: Site Emergency Plan, p. 7-2

c. Covert Township Fire Department (0.5)

Ref: Site Emergency Plan, p. 6-9

8.13 1. Decision to recommend protective actions to off-site organizations. (0.5)

2. Decision to evacuate the site. (0.5)

3. Decision to authorize exposures that exceed the 10 CFR 20 regulatory limits for emergency workers. (0.5)

Ref: Site Emergency Plan, p. 5-6

8.14 a. 23 (.25)

Ref: Tech Spec, p. 3-25

b. 4 (.25)

Ref: Tech Spec, p. 3-29

c. one on each bus (.25)

Ref: Tech Spec, p. 3-29

d. 118 inches in each tank (.25)

Ref: Standing Order No. 28