OPERATOR LICENSE EXAMINATION REPORT
No. 50-445/OL-85-03

Licensee: Texas Utilities Electric Company
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Docket: 50-445 Construction Permit: CPPR-126

Examinations administered at Comanche Peak Station (CPSES)

Chief Examiner: J. E. Whittemore — 7/10/85
J. E. Whittemore, Examiner — Date

Approved by: R. A. Cooley — 7/11/85
R. A. Cooley, Section Chief — Date

Summary

Examinations conducted on April 1-3, 1985

Written and oral examinations were administered to seven (7) Senior Reactor Operators and three (3) Reactor Operators, all of whom were currently cold licensed to operate CPSES facility. Three (3) Senior Reactor Operators and one (1) Reactor Operator failed the examination. All others passed.

CPSES OPERATOR LICENSE EXAMINATION REPORT

Report Details

1. Examination Results

Written and oral examinations were administered to seven (7) Cold Licensed Senior Reactor Operators and three (3) Reactor Operators. Three (3) Senior Reactor Operators and one (1) Reactor Operator failed the written examination. All examinees passed the oral examinations.

2. Examiners

J. E. Whittemore (Chief Examiner)
R. A. Cooley
S. L. McCrory

3. This examination report is composed of the sections below:

A. Examination Review and Comment Resolution

This section reflects comments made by the facility during the written examination review meeting held after completion of the written examinations. In general, editorial comments or changes made during the exam and subsequent review are not addressed. Modifications have been included in the master examination keys which are included elsewhere in this report. The following personnel were present for the written examination review.

NRC	Utility
D. N. Graves	R. Hawkins
J. E. Whittemore	D. Hubbard
	T. Lichty
	M. Niemeyer
	C. Turner

Comments and resolutions are listed by section question number.

COMMENTS

1. Question 3.03 Part c. asks for inputs used to calculate rod insertion limits. The answer key includes Tave. At CPSES the Tave input is set to zero which may cause examinees to ignore this input.

Resolution: Agree. Tave is not required for full credit answer.

2. Question 4.01 Part a. asks for actions required for a dropped fuel assembly striking another assembly. The key assumes fuel assemblies involved were spent fuel. Actions required by referenced procedures differ significantly concerning new fuel versus spent fuel. Since CPSES has no spent or reconditioned fuel on site, the examiner may assume new fuel and answer accordingly. There are no "Immediate Actions" in the sense of memorizing operating procedures immediate actions:

   Resolution: Key changed to reflect that assuming spent fuel is not required for full credit answer. The reference lists prompt or initial actions to be taken for a fuel handling accident involving spent or new fuel and these actions are not significantly different. It is expected that a marginally satisfactory operator would inherently possess the knowledge to: 1. Evacuate the area and, 2. Inform supervision. These minimum actions are required in either case.

3. Question 6.02 The question asks to list what inputs are supplied to Steam Generator Water Level Control. At CPSES a constant level program is used; therefore, the input from turbine impulse has been removed.

   Resolution: Agree. Key modified.

4. Question 7.03/ 7.07 CPSES does not require memorization of procedures or attachments other than immediate action steps. We require the individual to be familiar with the procedure and be able to use the procedures to operate the plant.

   Resolution: Neither answer was changed to reflect the generic comment above. Question 7.03 did not solicit detailed knowledge, but rather conceptual knowledge of how to determine the location of a leaking component. Any viable method of locating the leak was accepted as a correct answer for full credit. Question 7.10 sought only to identify equipment operated to specifically preclude voiding and did not solicit detailed procedural knowledge.

B. Exit Meeting Summary

At the conclusion of the CPSES site visit the examiners met with utility representatives to discuss results of the examinations. The following personnel were present for the exit meeting.

NRC	Utility
R. Cooley	L. Barnes
D. Graves	R. Jones
D. Kelly	R. Seidel
S. McCrory	C. Turner
J. Whittemore	

All requalification candidates were reported to have clearly passed the oral examinations. It was explained to those present that the written examination grades would not be available for at least one month and that the oral exam evaluations did not necessarily reflect written examination performance.

Areas of general weakness were reported to the facility. The identified weaknesses were found to exist with more than one candidate. The identified weaknesses were as follows:

1. Candidates experienced difficulty in utilizing the Unit Curve and Data Book.

2. Candidates exhibited a lack of familiarity with portable radiation survey instruments.

3. Senior Reactor Operators exhibited poor conceptual knowledge of basic plant transients and plant response to abnormalities.

4. Senior Reactor Operators were not familiar with procedures for proper document control, how to assure that drawings are current, and how to tell if design changes have been incorporated.

5. Non-shift operators do not always receive new specific information or changes important to plant operations.

6. Senior Reactor Operators that are performing shift duties as Reactor operators exhibit weakness in knowledge ir requirements and performance of plant administrative duties.

The utility was informed that preliminary examination results would be available in approximately 30 days.

The meeting concluded with the examiners thanking the utility for their efforts towards the examination effort.

C. Requalification Program Evaluation Report

Facility: Comanche Peak
Examiner: J. E. Whittemore
Date(s) of Evaluation: 4/1-3/85
Areas Evaluated: X Written X Oral ___ Simulator

Written Examination

1. Overall evaluation of examination: Marginal Performance

2. Evaluation of facility examination grading: N/A

Oral Examination

1. Overall evaluation Satisfactory

2. Number conducted 10

Simulator Examination

1. Overall evaluation NA

2. Number conducted ____

Overall Program Evaluation

Satisfactory ___ Marginal X* Unsatisfactory ___ (List major deficiency areas with brief descriptive comments)

*Pending completion of accelerated training and reexamination of licensed personnel who failed the written examination.

Submitted	Forwarded	Approved
J. E. Whittemore	R. A. Cooley	D. L. Hunter
Examiner	Section Chief	Branch Chief

D. CPSES Examination and Key

Date Administered: 4/1/85

Exam Type: Reactor Operator and Senior Operator Requalification

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: COMANCHE PEAK 1

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 85/04/01

EXAMINER: WHITTEMORE, J.

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

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

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY	
17.20	24.28	_____	_____	1.	PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
17.70	24.98	_____	_____	2.	PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
18.10	25.55	_____	_____	3.	INSTRUMENTS AND CONTROLS
17.85	25.19	_____	_____	4.	PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
70.85	100.00	_____	_____	TOTALS	

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 1.01 (1.20)

Complete the following table by supplying the missing words or phrases. Indicate direction, magnitude, and rate where applicable.

	Rx. Period	Rx. Power Response	Start Up Rate	
a.	Small positive	Rapid increase	( )	
b.	( )	Constant	( )	
c.	Large negative	( )	Small negative	(1.2)

QUESTION 1.02 (3.00)

a. Explain the terms beta bar and beta bar effective. Your answer should include an explanation of which term is larger in magnitude and why. (1.5)

b. Explain how and why the above mentioned terms will affect reactor response throughout cycle life. (1.5)

QUESTION 1.03 (2.50)

a. For an operator taking data for a 1/M plot, how will the Shutdown margin (SDM) affect the time elapsed before a stable count rate can be obtained after withdrawing rods ? (0.75)

b. How will the initial count rate affect the count rate at criticality ? (0.75)

c. If the speed of the control rods were to somehow increase. What would be the effect be on:

1. Rod height at criticality ? (0.5)

2. Count rate at criticality ? (0.5)

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

QUESTION 1.04 (2.75)

a. How and why will the magnitude of the Fuel Temperature Coefficient (FTC) change as fuel temperature changes ? (1.25)

b. Explain the effect on the magnitude of the FTC due to :

1. Core power (0.75)

2. Core burnup (0.75)

QUESTION 1.05 (1.75)

After 30 days at 50% power, plant power is raised to 100%. Explain the reactivity adjustments the operator may have to make due to fission product poisons until stable conditions are reached. Your answer should discuss both major poisons. (1.75)

QUESTION 1.06 (1.00)

A motor operated centrifugal pump is operating at rated flow when the discharge valve is throttled towards the shut direction. Which of the following statements best describes the parameter changes that will occur ?

a. Flow constant, discharge pressure constant, motor amps increase, NPSH increases.

b. Flow decreases, discharge pressure increases, motor amps increase, NPSH increases.

c. Flow decreases, discharge pressure increases, motor amps increase, NPSH decreases.

d. Flow decreases, discharge pressure increases, motor amps decreases, NPSH increases. (1.0)

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

QUESTION 1.07 (3.25)

Unit 1 is at 40% power when a single Reactor Coolant Pump (RCP) stops. Assume rod control in manual and no automatic or operator action occurs.

a. Describe what happens to the temperature of the affected loop and explain. (0.75)

b. Describe what happens to the delta T across all steam generators and the vessel or core. Explain. (1.0)

c. Describe what happens to unaffected steam generator pressure and explain. (0.75)

d. Explain the effect of stopping the RCP on individual loop and total coolant flow. (0.75)

QUESTION 1.08 (1.75)

a. How does requiring the operator to observe limits of Axial Flux Difference and Quadrant Power Tilt Ratio prevent exceeding core thermal limits ? (1.0)

b. Explain why significantly reduced RCS flow conditions will affect proximity to the Critical Heat Flux. (0.75)

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

QUESTION 2.01 (3.20)

a. What is the normal atmosphere inside the Pressurizer Relief Tank ? Why ? (0.8)

b. When relieving pressurizer safeties into the tank at approx. 650 degrees and 2250 psi, why isn't the safe operating pressure (~100#) of the tank exceeded ? (1.0)

c. What are the 2 methods available to cool the tank and what is the DISADVANTAGE of each method ? (1.4)

QUESTION 2.02 (3.00)

a. For long term post accident cooldown, how might the ECCS lineup differ for a small versus a large coolant system rupture, and why would a different lineup be necessary ? (1.2)

b. What provisions are available to prevent overpressurization of the Residual Heat Removal (RHR) system ? (0.8)

c. Describe how the RHR pumps are protected from vibrating or overheating when running for safety injection and RCS pressure increases above pump shut off head due to isolating the leak. (1.0)

QUESTION 2.03 (2.70)

a. Briefly describe how operation of the Reactor Coolant Pumps will be affected should the following inadvertant signals occur:

1. Phase "A" containment isolation. (0.6)

2. Phase "B" containment isolation. (0.6)

b. Briefly, in general terms, describe what action occurs for:

1. Control Room Emergency Recirculation signal. (0.5)

2. Control Room Emergency Ventilation signal. (0.5)

3. Control Room Ventilation Isolation signal. (0.5)

NOTE!__ Mention of specific fans, dampers, filters, valves, etc; is NOT required to answer this question for full credit.

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

QUESTION 2.04 (2.70)

a. Assume that one of the unit start-up transformers is out of service for maintenance and the other becomes disabled by a lightning strike during an outage condition. Describe alternate methods of supplying the unit class and non-class 6.9 KV buses. (1.2)

b. What determines if a 6.9 KV bus power supply will undergo a fast or slow transfer ? (1.5)

QUESTION 2.05 (1.40)

Briefly explain how to isolate a 118 VAC Class 1E inverter for maintenance and still maintain the inverter loads. (1.4)

QUESTION 2.06 (1.90)

Answer the following questions about the Auxiliary Feed System(AFW).

a. What prevents lowering the Condensate Storage Tank level below Technical Specification limit since it also supplies other systems ? (0.6)

b. What automatic action will occur upon AFW auto start and Safety Injection to ensure maximum available water for the AFW system ? (0.8)

c. Although the Service Water system is normally separated from the AFW system by 2 normally closed valves, what prevents contamination of AFW due to valve leakage ? (0.5)

QUESTION 2.07 (2.80)

a. List 8 major pieces of equipment used to remove a new fuel assembly from the shipping container, temporarily place in storage, and subsequently load it into the reactor. (1.6)

b. How does the manipulator operator know that the crane is positioned precisely for withdrawing or inserting a fuel assembly ? (1.2)

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

QUESTION 3.01 (2.20)

a. Briefly describe how the Nuclear instrument system is designed to terminate inadvertent dilution of the Reactor Coolant System, during shutdown or low power conditions. The answer should include setpoint(s), an explanation of how the feature is blocked or overridden, and automatic actions that occur. (1.2)

b. Describe 2 circuits associated with the Power Range Nuclear Instrument that will alert the operator to abnormal flux distribution. (1.0)

QUESTION 3.02 (2.70)

a. Control rod speed in automatic is determined by a "Total Error" signal . What signals are used to determine the total error signal ? (0.8)

b. State the automatic rod speed for the following total error signals:

1. 1 Degree

2. 2.5 Degrees

3. 4.5 Degrees (0.9)

c. State where and why the non-linear and variable gain units are used in the automatic control of rod speed. (1.0)

QUESTION 3.03 (2.10)

a. What are the 2 separate rod position conditions that will generate a rod deviation alarm ? (0.7)

b. What are the 2 auto rod withdrawal blocks that are NOT manual blocks ? (0.7)

c. What are the plant parameters used to calculate the control rod insertion limits ? (0.7)

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

QUESTION 3.04 (2.70)

a. In the steam dump control system, what parameters or signals are sensed to provide arming signals for turbine trip and loss of load ? Provide logic where applicable. (1.2)

b. Describe how and when the steam dump valves will receive a trip open signal. (1.5)

QUESTION 3.05 (2.70)

a. What are 2 of the 3 reasons that make it necessary to control the speed of the Main Feed Pumps ? (0.8)

b. Other than manual, what 3 signals will override the level control signal and shut the feedwater control valves ? (0.9)

c. How and why is reactor power used in controlling the feedwater control bypass valve ? (1.0)

QUESTION 3.06 (2.50)

a. What are the parameters that will vary or modify the Overtemperature N-16 trip setpoint. Explain how each parameter affects the setpoint. (1.5)

b. What is the purpose of the Overpower N-16 trip ? (0.5)

c. What protection is afforded by the Power Range Negative Rate trip ? (0.5)

QUESTION 3.07 (3.20)

a. Describe the instrument logic and setpoints necessary to insert the Reactor Coolant low flow trips into the protection system for 1 and 2 loop loss of flow. (1.2)

b. Explain how and why the undervoltage AND underfrequency low flow reactor trips operate differently. (2.0)

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

QUESTION 4.01 (2.00)

a. While acting as manipulator operator you observe the new fuel assembly that was just released fall over and strike another assembly:

1. What immediate action should you take ? (0.8)

2. After immediate action is carried out, what should be done with a fuel assembly in the vessel that appears to be damaged ? (0.6)

b. What should done if the hoist load starts decreasing before a fuel assembly is bottomed in the vessel ? (0.6)

QUESTION 4.02 (3.05)

a. For low failures of a Source or Intermediate range nuclear instrument channel the operator must take action dependent on power level at the time of failure. Indicate how required actions vary, depending on power level, and explain why, for both instruments. (1.8)

b. For a power range channel failure, why is the operator required to remove "Control Power" fuses from the affected channel drawer ? (0.75)

c. Why will a Power Range failure cause automatic control rod response if it fails high, but not when it fails low ? (0.5)

QUESTION 4.03 (2.80)

a. The procedure for a dropped control rod directs the operator to stabilize the plant before attempting retrieval. How is the plant stabilized ? (0.75)

b. When withdrawing a high worth rod from a dropped condition, how should the reactivity be compensated for ? (0.75)

c. How can the operator verify the position of a control rod with failed position indication ? (0.5)

d. With a unit at full power, what must be done if a non-indicating control rod position cannot be verified ? Why ? (0.8)

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

QUESTION 4.04 (2.00)

In the event it becomes necessary to evacuate the control room:

a. Where will the various control room licensed personnel for unit 1 proceed to ? (1.2)

b. How will the Shift Supervisor communicate with other plant operations personnel ? (0.8)

QUESTION 4.05 (2.80)

a. State 4 parameters that should be monitored to aid in identifying a steam generator with a tube rupture. (1.2)

b. State 4 actions that must be performed to isolate a steam generator with a tube rupture. (1.6)

QUESTION 4.06 (2.70)

a. Explain the term "Adverse Containment" that appears in the Emergency procedures and why the operator is given different limitations with adverse conditions. (1.5)

b. For depressurization after a tube rupture, how will the operator depressurize if:

1. Reactor Coolant Pumps (RCP's) running.
2. RCP's stopped, letdown in service.
3. RCP's stopped, letdown isolated. (1.2)

QUESTION 4.07 (2.50)

During blackout conditions you are able to manually start an Emergency Diesel Generator:

a. How will you manually load the safeguards bus if a Safety Injection signal exists ? Why ? (1.5)

b. What is the first load you would place on the bus ? Why ? (1.0)

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

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 1.01 (1.20)

a. Large positive (0.3)

b. Infinite, zero (0.6)

c. Slow decrease (0.3)

REFERENCE
WJE 1
Westinghouse Fundamentals of Nuclear Physics, P. 7-17

ANSWER 1.02 (3.00)

a. Beta bar is the average delayed neutron fraction or the weighted average fraction for the different fissionable materials present. [0.5] Beta bar effective is the effective fraction [0.25] and is smaller as it is the product of beta bar and an importance factor. [0.25] The importance factor is generally less than one as delayed neutrons are less likely to cause fission. [0.5] (Will accept an explanation of how the importance factor is affected by Fast Fission and Non-leakage factors) (1.5)

b. Beta bar and Beta Bar effective will decrease in value over cycle life [0.5] due to the changing concentrations of the different fissionable isotopes in the core. [0.5] Smaller values of the effective fraction means that the reactor period will be smaller or the reactor will respond quicker for a given reactivity change, as the core ages. [0.5] (1.5)

REFERENCE
WJE 2
Westinghouse Fundamentals of Nuclear Physics, Pp. 7-31,33,34,36,48

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 1.03 (2.50)

a. The closer to criticality, (less SDM) the longer time required to reach a stable count rate. (0.75)

b. A higher initial count rate will result in a higher count rate at criticality. (0.75)

c. 1. Critical rod height is not affected. (0.5)

2. Critical count rate will be lower. (0.5)

REFERENCE
WJE 4
Westinghouse Fundamentals of Nuclear Physics, Pp. 8-55,58,59

ANSWER 1.04 (2.75)

a. The magnitude of FTC decreases as fuel temperature increases[0.5] because the self shielding of the fuel decreases as the resonce peaks decrease in height. [0.75] (1.25)

b. 1. Fuel temperature increases as power increases ,[0.5] thus the magnitude of FTC decreases. [0.25] (0.75)

2. Fuel temperature decreases as core ages [0.5] so the FTC will decrease. [0.25] (0.75)

REFERENCE
WJE 5
Westinghouse Fundamentals of Nuclear Physics, P.6-41

ANSWER 1.05 (1.75)

The operator should only have to compensate for Xenon which will initially dip [0.5] and then attain it's 100% equilibrium concentration in 45-55 hours. (0.75) Samarium (may initially experience a slight dip in concentration) but should end up at the same equilibrium value. [0.5] (1.75)

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

REFERENCE
WJE 7
CPSES Curve Book, Fig's 1.12, 1.13, 1.14

ANSWER 1.06 (1.00)

ANSWER----- d.

REFERENCE
WJE 8
Westinghouse Thermal-Hydraulic Principles, Pp. 10-36 thru 10-47

ANSWER 1.07 (3.25)

a. Most of the coolant from the operating loops flows through the core, but some will flow backwards through the idle loop (due to the delta P across the core). [0.25] The net result is that the idle loop temperature becomes Tcold of the operating loops. [0.5] (0.75)

b. Since power demand has not changed, the remaining loops must make up for power not being supplied by the idle loop. [0.5] With delta T across the idle steam generator essentially zero (may be slightly reversed), the delta T across the operating S/G's and the core will increase. [0.5] (1.0)

c. With no heat transfer across the idle S/G, delta T (Tave.- Tstm) must increase for the operating S/G's. [0.5] This means that operating S/G temperature and pressure must decrease. [0.25] (0.75)

d. Total flow will stabilize somewhere above 75% [0.5] as the loss of 1 pump will decrease total head, increasing the flow rate of the operating pumps. [0.25] (0.75)

REFERENCE
WJE 9
Westinghouse Thermal-Hydraulic Principles, Pp. 12-15,16

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 1.08 (1.75)

a. By controlling power(flux) distribution within the core, the maximum heat generation and fuel temperature is limited. [0.5] By limiting the difference in flux between portions of the core, the maximum heat generation in an area is limited. [0.5] (1.0)

b. A reduction in flow rate causes an increase in coolant temperature. (0.75)

REFERENCE
WJE 12
Westinghouse Thermal-Hyd aulic Principles, Pp.13-11,12,13

ANSWER 2.01 (3.20)

a. Nitrogen, [0.4] to prevent inleakage of air and accumulating a mixture of H2 & O2. [0.4] (0.8)

b. Steam is discharged into the tank through a sparger underwater. [0.5] The steam is cooled and condensed by mixing with water near ambient temperature. [0.5] (1.0)

c. 1. Spraying with cool reactor makeup water [0.4] produces radioactive liquid waste. [0.3] (0.7)

2. Circulating water through the RCDT HX [0.4] takes an abnormally long time to cool the tank. [0.3] (0.7)

REFERENCE
WJE 22
System Description II-1, P.5.5

ANSWER 2.02 (3.00)

a. During conditions where RCS pressure is above RHR pump shut off head and the RWST is at low level. [0.6] The RHR pump discharge can be directed to the suction of the SI and Centrifugal Charging pumps, or RHR pumps may be stopped. [0.6] 1/2 credit for: Hot leg recirc. (1.2)

b. System inlet valves close on increasing pressure. [0.4] High capacity pump suction relief valves. [0.4] (0.8)

c. Part of the heat exchanger outlet flow is recirced back to the RHR pump suction. [0.5] A recirc flow control valve opens on low flow (575 GPM) and closes on increased flow (1200GPM). [0.5] (1.0)

REFERENCE
WJE 24
System Description II-6, Pp. 7,8,14

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 2.03 (2.70)

a. 1. RCP seal return will isolate, [0.3] but a relief valve will direct return flow to the PRT until normal seal flow can be re-established. [0.3] (0.6)

2. Virtually all cooling will be lost to the RCP's [0.3] which must be restored quickly or the pumps must be tripped. [0.3] (0.6)

b. 1. The system goes on closed loop recirculation. (0.5)

2. Aligns control room ventilation for Oxygen replenishment. (0.5)

3. Totally isolates control room from out side air (to preclude entry of toxic gas). (0.5)

REFERENCE
WJE 25
System Description II-7, Pp. 15,16,27,36

ANSWER 2.04 (2.70)

a. The non-class buses can be supplied by opening the 22 KV Main Generator disconnect [0.3] and feeding back from the main transformers to the Aux. transformers. [0.3] The class buses can be supplied by the non-class buses after they are powered as above [0.3] or supplied by the diesels. [0.3] (1.2)

b. A slow transfer will occur if:

1. Normal breaker open.
2. Running bus voltage < 35% normal.
3. Bus feeders tripped.
4. Alternate bus voltage > 85% [0.375 ea.

OR: A fast transfer will occur if:

1. Sufficient alternate power supply voltage.
2. Phases matched within 40 degrees.
3. Non 1E bus [0.5 ea.]

Accept either answer for full credit. (1.5)

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

REFERENCE
WJE 27
System Description VII-1, Pp. 17,40,41

ANSWER 2.05 (1.40)

It will be necessary to open the DC and AC feeders to the inverter. [0.5] Power can be supplied to the AC loads via the By-pass transformer. [0.5] by operation of the panel transfer switch. [0.4] (1.4)

REFERENCE
WJE 28
Dwng. # 2323-E1-0018

ANSWER 2.06 (1.90)

a. Other systems supplied by the tank are prevented from lowering the tank level below minimum by the elevation of their supply nozzles. (0.6)

b. Auto start - Isolates condensate make-up and reject lines. (0.4)

S.I. - De-energizes condensate transfer pump. (0.4)

c. There is a normally open high point leak off between the normally shut valves. (0.5)

REFERENCE
WJE 29
System Description VIII-8, Pp. 6-8

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 2.07 (2.80)

a. 1. Fuel Bldg. overhead crane.
   2. Inspection Machine.
   3. New Fuel Elevator.
   4. Fuel Bldg. Bridge Crane.
   5. RCCS change fixture.
   6. Transfer Car.
   7. Fuel Bldg. Upender.
   8. Containment Upender.
   9. Manipulator Crane [0.2 ea.]

   [any 8, 0.2 ea.] (1.6)

b. The bridge and trolley are positioned in relation to a pre-established grid pattern referenced to the core by an X-Y coordinate servo system, read directly by the operator. [1.0] A Video system allows the operator to view fuel assemblies position and movement. [0.2] (1.2)

REFERENCE
WJE 30
System Description X-1, Pp. 5,6,17

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 3.01 (2.20)

a. The source range provides a doubling signal set to actuate when flux doubles (within 9 minutes).[0.6] The signal will shift charging pump suction from the VCT to the RWST. [0.3] The feature is manually blocked for approach to criticality, with a back up block provided by P-6. [0.3] (1.2)

b. Detector current comparator compares each upper and lower detector with the average of the other upper and lower detector currents. [0.25] a (2%) deviation will cause an alarm. [0.25] (0.5)

The output of each channel is compared with the other 3 channels. [0.25] If 1 channel deviates (by more than 2%) from the lowest of the other channels an alarm will occur. [0.25] (0.5)

REFERENCE
WJE 13
System Description III-1, Pp.8,11

ANSWER 3.02 (2.70)

a. 1. Temperature error signal.
2. Power mismatch signal. [0.4 ea.]
OR;
1. Auct. Tave.
2. Tref.
3. Auct. Hi Power. [0.27 ea.] Accept either answer. (0.8)

b. 1. May be 0 or 8 steps/min.
2. 8 steps/min.
3. 56 steps/min. [0.3 each] (0.9)

c. Both are used in the power mismatch circuit. [0.4] The non-linear gain unit causes a larger change in power to have a larger effect on rod speed. [0.3] The variable gain unit imposes a lower gain at higher power levels. (prevents overshoot) [0.3] (1.0)

REFERENCE
WJE 14
System Description III-3, Pp.11,12

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 3.03 (2.10)

a. 1. Any shutdown rod < 210 steps. (0.35)
   2. any 2 rods in a bank > 6 steps apart. (0.35)

b. 1. Low power auto rod withdrawal block. (0.35)
   2. Bank "D" auto rod withdrawal block. (0.35)

c. 1. Tave. (0.35)
   2. % N-16 power. (0.35)

NOTE: Tave set to "0", allow full credit if omitted.

REFERENCE
WJE 15
System Description III-3, P.13 & III-4,Pp. 9,17

ANSWER 3.04 (2.70)

a. Loss of load: Turbine impulse pressure rate of decrease. (0.4)

   Turbine trip: 4 turbine stop valves closed. (0.4)
   2/3 turbine control oil pressures low. (0.4)

b. Only in the Tave mode [0.4] when sufficient Tave-Tref deviation exist to require high (50% or 100%) steam dump demand. [0.6] Air is routed directly to valve actuators (through arming solenoids) bypassing the pneumatic positioner. [0.5] (1.5)

REFERENCE
WJE 18
System description III-7, Pp. 4,7,8

ANSWER 3.05 (2.70)

FROM NOP.TAP linear range at low power.
2. Reduce pump power requirements.
3. Reduce feed control valve erosion. [any 2, 0.4 each] (0.8)

b. 1. High S/G level.
2. Rx. trip and low Tave.
3. Safety injection. [0.3 each] (0.9)

c. Auctioneered high power [0.3] is used to anticipate changing load on the S/G. [0.3] This will improve the response of the bypass valve. [0.4] (1.0)

REFERENCE
WJE 19
System Description III-8, Pp.2,5,6

ANSWER 3.06 (2.50)

a. T-cold [0.3] acts to lower trip setpoint when t-cold is above normal full power value. [0.2] (0.5)

RCS pressure [0.3] lowers setpoint when pressure is below rated pressure. [0.2] (0.5)

Delta-q [0.3] lowers setpoint if flux difference increases. [0.2] (0.5)

b. Protects against high power density (KW/FT.) (0.5)

c. DNB, [0.3] in the event of multiple rod drops. [0.2] (0.5)

REFERENCE
WJE 20
System Description III-9, Pp.6-8

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 3.07 (3.20)

a. 1. Single loop loss of flow will insert if 2/4 power ranges are above 48%. (0.4)

2. Two loop loss of flow will insert lf 2/4 power ranges >10% [0.3] OR; [0.2] 1/2 impulse pressures > 10% [0.3] (0.8)

b. The undervoltage trip is to provide a trip signal on loss of power to the RCP's. [0.4] The reactor will trip and RCP's continue to provide coastdown flow. [0.4] The underfrequency trip provides protection for a grid disturbance. [0.4] The RCP breakers and reactor are tripped [0.4] to prevent deceleration and loss of coastdown flow. [0.4] (2.0)

REFERENCE
WJE 21
System Description III-9,, Pp.9,10,48

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 4.01 (2.00)

a. 1. (Assume that the assembly struck may be spent fuel), notify Shift Supervisor [0.4] and immediatly evacuate. [0.4] (0.8)

2. If practical, place in the containment fuel storage racks or in a location specified by supervisor as an interim measure. (0.6)

b. Lift assembly clear of the vessel for inspection. (0.6)

REFERENCE
WJE 32
RFO 103, p.3 & RFO 302, P.4

ANSWER 4.02 (3.05)

a. Source Range-- With power below the P-6 setpoint, the channel must be repaired before any positive reactivity addition [0.3] as it is not considered safe to increase power from this level with 1 channel of indication and protection, thus it is a Tech. Spec. requirement. [0.3] Above the P-6 setpoint, continue operation as protection from Source Range is already blocked.[0.3]

Intermediate Range-- The operator must not add positive reactivity if the failure occurs < the P-10 setpoint [0.3] as Tech. Specs. require 2 channels at this power level. [0.3] Above P-10, continue normal operation as there is adequate protection available (from the Power Range). [0.3] (1.8)

b. To insert certain trips into the protection system and preserve the required tripping logic. (0.75)

c. The control signal uses auctioneered high power. (0.5)

REFERENCE
WJE 33
ABN 701A, 702A, 703A

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 4.03 (2.80)

a. Manipulate turbine load to match Tave and Tref.
(Accept dilution for 3/4 credit as dilution is not feasible at EOL.) (0.75)

b. Increase turbine load as Tave increases to match Tave/Tref[0.4] or borate [0.35] (0.75)

c. Determine position with in-core detector measurements. (0.5)

d. Reduce power (to 50%) [0.6] to ensure power distribution peaking factor limits are not exceeded. [0.2]
(Allow full credit for any conservative action) (0.8)

REFERENCE
WJE 34
ABN 712A

ANSWER 4.04 (2.00)

a. Shift Supervisor and RO to hot shutdown panel. [0.8] Relief RO to the switch transfer panel. [0.4] (1.2)

b. Gaitronics [0.4] and the Safe Shutdown sound powered phone system. [0.4] (0.8)

REFERENCE
WJE 35
ABN 905A

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 4.05 (2.80)

a. 1. Narrow range level
2. Blowdown rad. monitor
3. S/G sample activity
4. Steam line rad monitor
5. Feed flow > steam flow [any 4, 0.3 ea.] (1.2)

b. 1. Isolate AFW
2. Close MSIV's
3. Verify PORV's closed
4. Isolate steam to AFW pump
5. Isolate feedwater
6. Isolate B/D and sample [any 4, 0.4 ea.] (1.6)

REFERENCE
WJE 37
Facility question bank, ERG 21,22,

ANSWER 4.06 (2.70)

a. Containment pressure > 5 psig [0.3], > 5 REM/Hr. [0.3], Integrated contaiment dose > 10(E-6) RAD [0.3]. Instrumentation used during emergencies will be affected by these adverse conditions. [0.6] (CAF for more complete answer) (1.5)

b. 1. Normal spray.
2. Auxiliary spray.
3. Pzr. PORV'S [0.4 each] (1.2)

REFERENCE
WJE 38
EOS 3-1, Step 8

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 4.07 (2.50)

a. Reset the SI signal OR; place control switches in "Pull To Lock" [either method 0.75] to prevent energizing unwanted loads and jeopardizing newly acquired power source. [0.75] (1.5)

b. A station service water pump [0.5] to supply diesel cooling water. [0.5] (1.0)

REFERENCE
WJE 39
ECA 0.0, P.5

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

FACILITY: COMANCHE PEAK 1

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 85/04/01

EXAMINER: WHITTEMORE, J.

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

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

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
17.90	25.72	_____	_____	5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
17.20	24.71	_____	_____	6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
17.30	24.86	_____	_____	7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
17.20	24.71	_____	_____	8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
69.60	100.00	_____	_____	TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 5.01 (2.60)

A clean core is started up and taken to 50 % power, where it remains for 30 days:

a. Describe the reactivity changes the operator must compensate for due to fission product poisons. (1.4)

b. After 30 days power is increased to 100%. Explain any further reactivity changes required. (Specific reactivity values are NOT required) (1.2)

NOTE! Indicate approximate time and duration of reactivity changes.

QUESTION 5.02 (1.20)

Complete the following table by supplying the missing words or phrases. Indicate direction, magnitude, and rate where applicable.

	Rx. Period	Rx. Power Response	Start Up Rate	
a.	Small positive	Rapid increase	( )	
b.	( )	Constant	( )	
c.	Large negative	( )	Small negative	(1.2)

QUESTION 5.03 (2.50)

a. For an operator taking data for a 1/M plot, how will the Shutdown margin (SDM) affect the time elapsed before a stable count rate can be obtained after withdrawing rods ? (0.75)

b. How will the initial count rate affect the count rate at criticality ? (0.75)

c. If the speed of the control rods were to somehow increase. What would be the effect be on:

1. Rod height at criticality ? (0.5)

2. Count rate at criticality ? (0.5)

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.04 (2.75)

a. How and why will the magnitude of the Fuel Temperature Coefficient (FTC) change as fuel temperature changes ? (1.25)

b. Explain the effect on the magnitude of the FTC due to :

1. Core power (0.75)

2. Core burnup (0.75)

QUESTION 5.05 (2.80)

From the statements below, choose the most correct words or phrases (in parentheses) and write them on your answer sheet:

a. The ratio of peak to average value of power distribution is known as (peaking factor, thermal limit). (0.4)

b. The value of the Heat Flux Hot Channel factor will (increase, decrease, remain constant) when power is decreased. (0.4)

c. The Heat Flux Hot Channel factor limit (assures, does not assure) that DNB will not occur during normal operation. (0.4)

d. Calculation of Enthalpy Rise Hot Channel factor assumes core power is (uniform, not uniform) and flow through each channel is (the same, different) throughout the core. (0.8)

e. With a (higher, lower) value of Enthalpy Rise Hot Channel factor, the coolant is (closer to, further away from) DNB conditions. (0.8)

QUESTION 5.06 (2.80)

a. Explain what happens to the enthalpy change (h=BTU/LBM) on the secondary side of the steam generator as power is increased. (1.2)

b. Theoretically, if RCS flow were doubled, the core delta T would halve, resulting in less complicated reactivity effects and better core power distribution. Why wouldn't this design change be cost effective ? (1.6)

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.07 (3.25)

Unit 1 is at 40% power when a single Reactor Coolant Pump (RCP) stops. Assume rod control in manual and no automatic or operator action occurs.

a. Describe what happens to the temperature of the affected loop and explain. (0.75)

b. Describe what happens to the delta T across all steam generators and the vessel or core. Explain. (1.0)

c. Describe what happens to unaffected steam generator pressure and explain. (0.75)

d. Explain the effect of stopping the RCP on individual loop and total coolant flow. (0.75)

(***** END OF CATEGORY 05 *****)

QUESTION 6.01 (2.40)

During normal operation at 75% power a single Power Range channel upper detector fails high. Procedures ABN-703A requires that the failed channel be defeated. Explain why the following actions must be taken.

a. Place the Rod Stop Bypass switch in bypass. (0.6)

b. Place the Power Mismatch switch in bypass. (0.6)

c. Place the Upper and Lower Section Selector switches to the failed channel. (0.6)

d. Select the failed channel on the Comparator Channel Defeat switch. (0.6)

QUESTION 6.02 (2.90)

a. What are the three plant parameter input signals used by the three element Steam Generator Feedwater Control System? (Do not include turbine impulse pressure or steam pressure.) (0.9)

b. What is the purpose of the turbine impulse pressure signal used in the S/G Level Control System? (0.5)

c. Considering the Steam Generator Level Control System, indicate the effects of a high failure of the Steam Header Pressure detector. Assume power at 50%, and no operator action. Consider instrument failure with Feed Pump speed control in automatic AND in manual. (1.5)

QUESTION 6.03 (3.20)

a. Describe the instrument logic and setpoints necessary to insert the Reactor Coolant low flow trips into the protection system for 1 and 2 loop loss of flow. (1.2)

b. Explain how and why the undervoltage AND underfrequency low flow reactor trips operate differently. (2.0)

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.04 (3.00)

a. For long term post accident cooldown, how might the ECCS lineup differ for a small versus a large coolant system rupture, and why would a different lineup be necessary ? (1.2)

b. What provisions are available to prevent overpressurization of the Residual Heat Removal (RHR) system ? (0.8)

c. Describe how the RHR pumps are protected from vibrating or overheating when running for safety injection and RCS pressure increases above pump shut off head due to isolating the leak. (1.0)

QUESTION 6.05 (2.70)

a. Assume that one of the unit start-up transformers is out of service for maintenance and the other becomes disabled by a lightning strike during an outage condition. Describe alternate methods of supplying the unit class and non-class 6.9 KV buses. (1.2)

b. What determines if a 6.9 KV bus power supply will undergo a fast or slow transfer ? (1.5)

QUESTION 6.06 (1.40)

Briefly explain how to isolate a 118 VAC Class 1E inverter for maintenance and still maintain the inverter loads. (1.4)

QUESTION 6.07 (1.60)

a. What plant conditions are required before the Pressurizer Pressure Safety Injection signal can be blocked ? (0.5)

b. How is the signal unblocked ? (0.5)

c. Name any other function(s) generated by this signal ? (0.6)

(***** END OF CATEGORY 06 *****)

QUESTION 7.01 (3.00)

During initial fuel load:

a. After inserting a fuel assembly into the core, when can the grippers be released ? (0.6)

b. If loading is suspended for a 10 hr. period due to problems with vessel level, what are 2 requirements that must be satisfied before continuing fuel load ? (1.0)

c. Where are fuel status boards maintained ? (0.9)

d. What is unique about the first fuel assembly inserted into the vessel, after the temporary neutron detectors are in place ? (0.5)

QUESTION 7.02 (2.60)

a. For control of the plant in hot standby from outside the control room, what are the general guidelines to be used in the decision to transfer control of equipment to the Hot Shutdown Panel ? (1.0)

b. Why is it not desirable to transfer control of pressurizer pressure and level upon control room evacuation ? (0.8)

c. If access to the control room or cable spreading room is not possible, how can safety injection be blocked for cooldown ? (0.8)

QUESTION 7.03 (3.00)

a. For leakage INTO the Component Cooling System (CCW), initial action required of the operator is to stop safeguards equipment in the affected train. What equipment is affected ? (0.9)

b. Describe how the system is manipulated to find which loop has the leaking component. (1.2)

c. Once the loop is identified, what are 3 checks that can be performed to identify the leaking component ? (0.9)

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.04 (2.80)

a. The procedure for a dropped control rod directs the operator to stabilize the plant before attempting retrieval. How is the plant stabilized ? (0.75)

b. When withdrawing a high worth rod from a dropped condition, how should the reactivity be compensated for ? (0.75)

c. How can the operator verify the position of a control rod with failed position indication ? (0.5)

d. With a unit at full power, what must be done if a non-indicating control rod position cannot be verified ? Why ? (0.8)

QUESTION 7.05 (2.00)

In the event it becomes necessary to evacuate the control room:

a. Where will the various control room licensed personnel for unit 1 proceed to ? (1.2)

b. How will the Shift Supervisor communicate with other plant operations personnel ? (0.8)

QUESTION 7.06 (1.50)

For a Reactor coolant system water inventory balance (leak rate) test:

a. What are the time and plant conditions specified for a successful test ? (0.7)

b. Describe how the CVCS volume change is determined for the test ? (0.8)

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.07 (2.40)

During natural circulation cooldown:

a. What are 2 restrictions imposed by the procedure to minimize the possibility of void formation ? (0.8)

b. What equipment is required to be operating by EOS-02 to minimize the possibility of vessel head void formation ? (0.4)

c. When cooling down with a void and it becomes possible to restore forced flow, where (relative values) would you adjust pressurizer temperature and level before and after attaining forced coolant flow ? (1.2)

(***** END OF CATEGORY 07 *****)

QUESTION 8.01 (2.60)

a. What are the minimum requirements for licensed personnel when :

1. Two units are in mode 5 ?

2. One unit in mode 6, no fuel movement in progress, and the other in mode 1 ?

3. Both units in mode 1 ? (1.8)

NOTE! Be specific as to the type of license required and required location.

b. What is the general nature of the Shift advisors responsibilities and to whom does he report ? (0.8)

QUESTION 8.02 (2.90)

a. Is it permissible at Comanche Peak to disable a "Nuisance" annunciator ? Explain. (0.8)

b. What precaution must be exercised when disabling an annunciator for maintenance ? (0.8)

c. As the oncoming Shift Supervisor, how could you recognize an annunciator or instrument that was out of service ? (0.5)

d. Where could you obtain information on the disabled indication ? (0.8)

QUESTION 8.03 (2.50)

a. Explain the 3 types of temporary changes to procedures. Include time limits or expiration times where appropiate. (1.5)

b. Explain the different terms in the following procedure designation:

OPT-TP-85A-2 (1.0)

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.04 (3.10)

a. Upon activation of the emergency plan, what are the 2 basic duties to be performed by the Shift Advisor ? (0.8)

b. Describe how the responsibility for Emergency Coordinator would shift after declaring an Unusual Event that gradually escalates to a Site Emergency. (1.0)

c. Name all individuals by (title) who can assume responsibility as:

1. Technical Support Center Manager ?

2. Operations Support Center Manager ? (1.3)

QUESTION 8.05 (2.80)

a. How is a valid Quadrant Power Tilt Ratio (QPTR) obtained with one Power Range instrument inoperable ? (1.2)

b. Why are the detector current values normalized in the calculation ? (0.8)

c. How many penalty minutes would be assessed for the following Axial Flux Difference conditions at Beginning of life ?

	POWER LEVEL	TIME	AFD
1.	90%	10 min.	+6%
2.	60%	20 min.	-5%
3.	45%	12	-7%
4.	10%	1 hour	+9%

(0.8)

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.06 (1.80)

During operation at full power the Reactor Operator informs the SRO in the control room that the plant is being operated in violation of a safety limit.

a. What are the specific safety limits of concern ? (0.8)

b. Why is the above scenario very unlikely to ever occur ? (1.0)

QUESTION 8.07 (1.50)

a. What comprises Non-Compliance with a Technical Specification ? (0.75)

b. Is it ever allowable to enter an operational mode without meeting the Limiting Conditions for Operation for the mode being entered ? Explain. (0.75)

(***** END OF CATEGORY 08 *****)
(********** END OF EXAMINATION **********)

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 5.01 (2.60)

a. The operator must withdraw rods or dilute the RCS to compensate for the build up of Xenon to equilibrium in 45-55 hours [0.8] and Samarium in 400-500 hours. [0.6] (1.4)

b. Again Xenon will increase to a new higher equilibrium value in 45-55 hours. [0.6] Samarium reactivity will not change. [0.6] (Both may undergo a slight dip before increasing to or returning to equilibrium) (1.2)

REFERENCE
WJE 58
Curve Book fig;s 1.12, 1.13, 1.16

ANSWER 5.02 (1.20)

a. Large positive (0.3)

b. Infinite, zero (0.6)

c. Slow decrease (0.3)

REFERENCE
WJE 59
Westinghouse Fundamentals of Nuclear Physics, P. 7-17

ANSWER 5.03 (2.50)

a. The closer to criticality, (less SDM) the longer time required to reach a stable count rate. (0.75)

b. A higher initial count rate will result in a higher count rate at criticality. (0.75)

c. 1. Critical rod height is not affected. (0.5)

2. Critical count rate will be lower. (0.5)

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

REFERENCE
WJE 4
Westinghouse Fundamentals of Nuclear Physics, Pp. 8-55,58,59

ANSWER 5.04 (2.75)

a. The magnitude of FTC decreases as fuel temperature increases[0.5] because the self shielding of the fuel decreases as the resonce peaks decrease in height. [0.75] (1.25)

b. 1. Fuel temperature increases as power increases ,[0.5] thus the magnitude of FTC decreases. [0.25] (0.75)

2. Fuel temperature decreases as core ages [0.5] so the FTC will decrease. [0.25] (0.75)

REFERENCE
WJE 5
Westinghouse Fundamentals of Nuclear Physics, P.6-41

ANSWER 5.05 (2.80)

a. Peaking Factor (0.4)

b. Increase. (0.4)

c. Does not assure. (0.4)

d. Not uniform, [0.4] The same [0.4] (0.8)

e. High, [0.4] further away from [0.4] OR
Lower, [0.4] closer to [0.4] (0.8)

REFERENCE
WJE 51
Thermal-Hydraulic Principles, Pp. 13- 30 thru 36

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 5.06 (2.80)

a. Although saturation temperature of the S/G exit steam decreases slightly as power increases [0.3] the feedwater temperature increases [0.3] due to improved effectiveness of the feedwater heaters. [0.3] This results in a net smaller increase across the S/G with increasing power. [0.3] (1.2)

b. In order to achieve more flow you would need:

More flow paths [0.4] or larger pumps and pipes [0.6] which result in more engineering and material cost. [0.6]
OR;
Higher pump speed, [0.8] changing flow in this manner would result in pumping power requirements increasing exponentially. [0.8]

Accept either answer for full credit. (1.6)

REFERENCE
WJE 53
Westinghouse Thermal Hydraulic Principles, Pp. 12-12,13

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 5.07 (3.25)

a. Most of the coolant from the operating loops flows through the core, but some will flow backwards through the idle loop (due to the delta P across the core). [0.25] The net result is that the idle loop temperature becomes Tcold of the operating loops. [0.5] (0.75)

b. Since power demand has not changed, the remaining loops must make up for power not being supplied by the idle loop. [0.5] With delta T across the idle steam generator essentially zero (may be slightly reversed), the delta T across the operating S/G's and the core will increase. [0.5] (1.0)

c. With no heat transfer across the idle S/G, delta T (Tave.- Tstm) must increase for the operating S/G's. [0.5] This means that operating S/G temperature and pressure must decrease. [0.25] (0.75)

d. Total flow will stabilize somewhere above 75% [0.5] as the loss of 1 pump will decrease total head, increasing the flow rate of the operating pumps. [0.25] (0.75)

REFERENCE
WJE 9
Westinghouse Thermal-Hydraulic Principles, Pp. 12-15,16

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 6.01 (2.40)

a. Defeat the 103% overpower rod stop. (0.6)

b. Defeats the failed P/R channel input to Rod Control. (0.6)

c. Removes the faulty input to the Detector Current Comparator (Current Deviation Alarm) (axial) (0.6)

d. Removes the faulty channel input to the Channel Current Comparator (Channel Deviation Alarm) (quadrant) (0.6)

REFERENCE
WJE 74
ABN-703A, P. 3 & System Description III-1, Pp.20-24

ANSWER 6.02 (2.90)

a. 1. Feedwater Flow.
2. Steam Flow.
3. S/G Water Level. (Error signal) [0.3 ea.] (0.9)

b. To provide a level setpoint. (0.5)

c. With the feed pumps in manual, there is no effect to consider. [0.5] With the pumps in auto the initial effect will be for pump speed to increase and FCV's to close down. [0.5] The system maintain S/G level. [0.5] (Allow full credit for Rx. trip due to high S/G level.) (1.5)

REFERENCE
WJE 75
System Description IV-8, P.14 & IV-3, P.10

ANSWER 6.03 (3.20)

a. 1. Single loop loss of flow will insert if 2/4 power ranges are above 48%. (0.4)

2. Two loop loss of flow will insert If 2/4 power ranges >10% [0.3] OR; [0.2] 1/2 impulse pressures > 10% [0.3] (0.8)

b. The undervoltage trip is to provide a trip signal on loss of power to the RCP's. [0.4] The reactor will trip and RCP's continue to provide coastdown flow. [0.4] The underfrequency trip provides protection for a grid disturbance. [0.4] The RCP breakers and reactor are tripped [0.4] to prevent deceleration and loss of coastdown flow. [0.4] (2.0)

REFERENCE
WJE 21
System Description III-9,, Pp.9,10,48

ANSWER 6.04 (3.00)

a. During conditions where RCS pressure is above RHR pump shut off head and the RWST is at low level. [0.6] The RHR pump discharge can be directed to the suction of the SI and Centrifugal Charging pumps, or RHR pumps may be stopped. [0.6] 1/2 credit for: Hot leg recirc. (1.2)

b. System inlet valves close on increasing pressure. [0.4] High capacity pump suction relief valves. [0.4] (0.8)

c. Part of the heat exchanger outlet flow is recirced back to the RHR pump suction. [0.5] A recirc flow control valve opens on low flow (575 GPM) and closes on increased flow (1200GPM). [0.5] (1.0)

REFERENCE
WJE 24
System Description II-6, Pp. 7,8,14

ANSWER 6.05 (2.70)

a. The non-class buses can be supplied by opening the 22 KV Main Generator disconnect [0.3] and feeding back from the main transformers to the Aux. transformers. [0.3] The class buses can be supplied by the non-class buses after they are powered as above [0.3] or supplied by the diesels. [0.3] (1.2)

b. A slow transfer will occur if:

1. Normal breaker open.
2. Running bus voltage < 35% normal.
3. Bus feeders tripped.
4. Alternate bus voltage > 85% [0.375 ea.

OR; A fast transfer will occur if:

1. Sufficient alternate power supply voltage.
2. Phases matched within 40 degrees.
3. Non 1E bus. [0.5 ea.]

Accept either answer for full credit. (1.5)

REFERENCE
WJE 27
System Description VII-1, Pp. 17,40,41

ANSWER 6.06 (1.40)

It will be necessary to open the DC and AC feeders to the inverter. [0.5] Power can be supplied to the AC loads via the By-pass transformer. [0.5] by operation of the panel transfer switch. [0.4] (1.4)

REFERENCE
WJE 28
Dwng. # 2323-E1-0018

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 6.07 (1.60)

a. May be blocked when PZR pressure is below 1960 psig. (0.5)

b. Unblocked automatically when pressure goes above 1960 psig. (0.5)

c. Increasing pressure (above 1960 psig) automatically opens the accumulator discharge valves. (0.6)

REFERENCE
WJE 83
Facility question bank, Log-4

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 7.01 (3.00)

a. Only after ICRR reference data has been taken and found not to indicate any abnormalities. (0.6)

b. 1. Determine a new ICRR reference value. [0.5]
2. Perform a response check on all neutron indication. [0.5] (1.0)

c. 1. Fuel Bldg.
2. Containment
3. Control room [0.3 ea.] (0.9)

d. It has a neutron source. (0.5)

REFERENCE
WJE 55
ISU-001A, Pp. 12,35,39,40

ANSWER 7.02 (2.60)

a. Should not be transferred unless control of the equipment is needed [0.5] or evacuation was due to a fire [0.5] (1.0)

b. Leaving the system in auto does not require the operator's constant attention, [0.4] and the heater /level interlock is overridden in local. [0.4] (0.8)

c. The affected equipment must have control shifted to the "HSP".
OR;
Power supply breakers must be racked out.
(Either answer for full credit.) (0.8)

REFERENCE
WJE56
IPO-008A, Pp. 3,10,15

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 7.03 (3.00)

a. CCP, SI Pump, RHR Pump, CS Pump, Control Rm. A/C units, Safety Chill Water System. [0.15 ea.] (0.9)

b. Shift to the standby loop and equipment supplied by it. [0.3] If surge tank level increase stops, leak was in the affected safeguards or the non-safeguards loops. [0.3] Shift the non-safe loop to the stand by loop. [0.3] If level increases, the leak is in the non-safeguards loop. [0.3] (1.2)

c. Check CCW outlet temp, activity, or boron. [0.3 ea.] (0.9)

REFERENCE
WJE 57
ABN 502A,Pp.5,7

ANSWER 7.04 (2.80)

a. Manipulate turbine load to match Tave and Tref.
(Accept dilution for 3/4 credit as dilution is not feasible at EOL.) (0.75)

b. Increase turbine load as Tave increases to match Tave/Tref[0.4] or borate [0.35] (0.75)

c. Determine position with in-core detector measurements. (0.5)

d. Reduce power (to 50%) [0.6] to ensure power distribution peaking factor limits are not exceeded. [0.2]
(Allow full credit for any conservative action) (0.8)

REFERENCE
WJE 34
ABN 712A

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 7.05 (2.00)

a. Shift Supervisor and RO to hot shutdown panel. [0.8] Relief RO to the switch transfer panel. [0.4] (1.2)

b. Gaitronics [0.4] and the Safe Shutdown sound powered phone system. [0.4] (0.8)

REFERENCE
WJE 35
ABN 905A

ANSWER 7.06 (1.50)

a. Steady state [0.35] for a minimum of 3 hours. [0.35] (0.7)

b. Add the total amount of make up [0.4] and the VCT volume change. [0.4] (0.8)

REFERENCE
WJE 40
OPT 303

ANSWER 7.07 (2.40)

a. The procedure requires a slow cooldown rate (50 degrees/hr.)[0.4] and maintaining a high (60 degree) subcooling margin. [0.4] (0.8)

b. Must run all available CRDM cooling fans. (0.4)

c. Before starting RCP's, pressurizer temperature should be adjusted so that RCS temperature will be subcooled (when bubble shifts to pressurizer), [0.3] and level should be high. [0.3] After starting, adjust level to normal [0.3] and pressurizer temperature to provide normal required subcooling of the RCS. [0.3] (1.2)

REFERENCE
WJE 90
EOS-0.2, Pp.4,5 & EOS-0.4, Pp.3,4

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 8.01 (2.60)

a. 1. Two SRO's on site, [0.3] and one RO in each control room. [0.3]

2. One SRO in control room, and another on site, [0.3] two RO's in control room,and another on site. [0.3]

3. Same as #2 above. [0.6] (1.8)

b. Responsible to assist the Shift Supervisor in evaluating operating activities [0.4] reports to the Operations Supervisor [0.4](0.8)

REFERENCE
WJE 41
ODA 103, Pp. 8,10

ANSWER 8.02 (2.90)

a. Yes, [0.4] if the Shift Supervisor feels it is a detriment to proper plant operation. [0.4] (0.8)

b. An annunciator card can affect 2 alarms [0.4] and a required alarm might be disabled. [0.4] (0.8)

c. Should have an out of service sticker attached. (0.5)

d. Off going Shift Supervisor .
OR; The Annunciator/Instrument out of service log.
(Full credit for either answer.) (0.8)

REFERENCE
WJE 42
ODA 401

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 8.03 (2.50)

a. 1. One time only, [0.3] for when it is anticipated that the procedure will not be used again. [0.2]

2. Extended, [0.3] required for a limited period of time, but may be used several times for 30 days. [0.2]

3. Permanent, [0.3] is a change to a procedure that will become permanent and is effective for 90 days [0.2] (1.5)

b. OPT------Manual affected by temporary procedure
TP-------Temporary Procedure
85-------Year issued
A--------Unit 1 (B= unit 2)
2--------Sequential # affecting OPT manual in 1985 [0.2 ea.] (1.0)

REFERENCE
WJE 44
STA-204, P.3 & STA 205, Pp. 2,4

ANSWER 8.04 (3.10)

a. Advise and assist the Shift Supervisor as directed or needed. (0.8)

b. Initially the Shift Supervisor will act as Emergency Coordinator until augmentation when the TSC is manned. [0.2] The TSC Mgr. becomes responsible [0.3] until the EOF is manned and the EOF Mgr. becomes responsible. [0.3] (1.0)

c. TSC-----Mgr. Plant Operations
Eng. Superintendent
Operations Superintendent
Maintenance Superintendent [0.2 each] (0.8)

OSC----Mech. Maint. Engr.
Elec. Maint. Engr.
Mech. Maint. Sup. [0.167 ea.] (0.5)

REFERENCE
WJE 46
EPP-112, P.4 & Epp-204 P.4

ANSWERS -- COMANCHE PEAK 1 -85/04/01-WHITTEMORE, J.

ANSWER 8.05 (2.80)

a. The calculation is performed using operable detectors [0.6] and QPTR is verified consistant with tilt factors using the in-core detectors [0.6] (1.2)

b. Always normalized to the same high power value for consistancy so that problems will be detected at lower power levels. (0.8)

c. 1. 10 min.

2. 0

3. 6min.

4. 0 [0.2ea.] (0.8)

REFERENCE
WJE 48
OPT-302, P.2 & OPT-403, P.4

ANSWER 8.06 (1.80)

a. 1. Core safety limit.
2. RCS pressure limit. [0.4 ea.] (0.8)

b. Limiting Safety System setpoints will cause automatic shutdown to preclude operating outside of safe envelope, [0.5] and the RCS over pressure protection system will prevent exceeding RCS safe pressure limit. [0.5 (1.0)

REFERENCE
WJE 49
T.S. 2.1

ANSWER 8.07 (1.50)

a. Non-compliance exists when the LCO's [0.25] and any associated Action Statements [0.25] are not met within the specified time interval. [0.25] (0.75)

b. Yes, [0.5] when it is necssary to pass through or to a mode to comply with an action statement. [0.25] (0.75)

REFERENCE
WJE 50
T.S. 3.01 & 3.04