ENCLOSURE 1

EXAMINATION REPORT NO. 50-302/OL-84-01

Facility Licensee: Florida Power Corporation

Facility Name: Crystal River 3

Facility Docket No. 50-302

Written and oral examinations were administered at Crystal River Unit 3, near Crystal River, Florida.

Chief Examiner: A. H. Johnson — Date Signed: 10/30/84

Approved by: Bruce A. Wilson, Section Chief — Date Signed: 10/30/84

Summary:

Examinations on July 17 - 19, 1984

Oral examinations were administered to five candidates; four of whom passed. Five candidates were administered written examinations; all of whom passed.

REPORT DETAILS

1. Persons Examined

Instructor Certification

Arbuthnot, Charles D.	55-7443
Brandely, James G.	55-20416
Galiion, Ernest J.	55-8229
Smith, Dan H.	55-8235
Smith, Donald E.	55-20417

Other Facility Employees Contacted:

*P. F. McKee, FPL, Plant Manager
*B. E. Crane, FPL, Training Director
*J. R. Kraiker, FPL, Operation Supervisor
*J. R. Cuneo, FPL, Nuclear Operation Training Supervisor
D. P. Jones, FPL, Crystal River Plant
J. G. Smith, FPL, Crystal River Plant
J. Springer, FPL, Crystal River Plant
R. C. Zareck, FPL, Crystal River Plant

2. Examiners

*A. H. Johnson (NRC)
M. King (EG&G)

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners met with D. P. Jones, J. G. Smith, J. Springer, and R. C. Zareck to review the written examination and answer key. The following comments were made by the facility reviewers:

SRO Exam

a. Question 5.7.b

Facility Comment: Doppler = 0 - 100% predominant, instead of 15 - 100%

NRC Resolution: Doppler feedback is over entire power range.

b. Question 6.2.a

Facility Comment: Answer key 6.2.c should state "No Effect"

NRC Resolution: Changed answer key "No Effect" due to wording of question. There is no direct ES signal to booster pumps as per STM-23-7.

c. Question 6.4.a

Facility Comment: Add clarification to answer key 6.4.a to state "with bypass valves closed."

NRC Resolution: Clarification added. STM-13-16 is not in agreement with ICS Analog and Digital drawings.

d. Question 6.8.c

Facility Comment: Answer key 6.8.c should state (2)" + (3)"

NRC Resolution: Changed answer key 6.8.c adding "(3)", due to change in facility procedure.

e. Question: 8.5.b

Facility Comment: Answer key 8.5.b should be "True" and not False.

NRC Resolution: Changed answer key 8.5.b to state "True". There is a conflict between EM-207 and OSIM pg. IV-4.

f. Question 8.9

Facility Comment: Similar question to question 8.16

NRC Resolution: Deleted question 8.9 and reduced Category B point value to 23.75. During exam administration, this question was discovered to be very similar to 8.16.

4. Exit Meeting

At the conclusion of the site visit the examiners met with representatives of the plant staff to discuss the results of the examination. Those individuals who clearly passed the oral examination were identified.

There were no generic weakness noted during the oral examination.

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

Enclosure 3

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

Facility: Crystal River Unit 3

Reactor Type: Babcock & Wilcox

Date Administered: July 17, 1984

Examiner: A. Johnson

Candidate: _____

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	Category (% of) Value		Category
25.0	25.0	_____	_____	5.	Theory of Nuclear Power Plant Operation, Fluids, and Thermodynamics
25.0	25.0	_____	_____	6.	Plant System Design, Control and Instrumentation
25.0	25.0	_____	_____	7.	Procedures - Normal, Abnormal, Emergency and Radiological Control
~~25.0~~ 23.75	~~25.0~~ 23.75	_____	_____	8.	Administrative Procedures, Conditions, and Limitations
100 98.75		_____			Totals

Final Grade _____%

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

_____
Candidate's Signature

5. Theory of Nuclear Power Plant Operation, Fluids and Thermodynamics (25)

5.1 a. Are the effects of a steam line break worse at BOL or EOL? Why? (1.0)

b. Are the effects of a steam line break worse at full power or no-load Tave? Why? (1.0)

c. What Tech Spec limits apply that are intended to insure the resulting cooldown does not cause a restart of the reactor? (1.0)

5.2 Assume the reactor is at 50% power, equilibrium Xenon, near EOL conditions, regulating rod index of 220. It is desired to ramp power level up to the 90% hold point over a 4 hour period.

a. Using the attached figures, estimate the rod index upon reaching 90% power. (Neglect Xenon effects.) (1.5)

b. After reaching 90% power, what rod motion will occur, due to Xenon effects only, if all controls are left in auto and no boron changes are made? (Numbers are not required, consider for 40 hours.) (1.5)

5.3 With respect to question 5.~~3~~2:

a. If the power imbalance is slightly negative at 50% power, which way will it trend as you withdraw rods to go 90%? Why? (1.0)

b. Assume APSR's at 19% withdrawn upon reaching 90% power, which way should they be moved to correct the imbalance? Why? (1.0)

5.4 Concerning The Moisture Separtor Reheaters:

a. (1) steam heats the first stage reheater and (2) steam is used to heat the second stage reheater. (1.0)

b. The purpose of the MSRs during a cold startup is to (1), during a hot startup to (2). (1.0)

c. How do the following conditions of the steam change as the steam passes through the MSR? (increase, decrease or remain the same)

1. Temperature (.25)
2. Quality (.25)
3. Enthalpy (.25)
4. Entropy (.25)

5.5 The following signals are used to derive the BTU limit in the ICS. Indicate how each would change to increase the BTU limit. (increase, decrease or remain the same)

1. TH (.25)
2. S/G pressure (.25)
3. RC flow (.25)
4. FW Temperature (.25)

5.6 The amount of aspirating steam (lbm/hr) used in the OTSG. (1.0)

(A) Increases as power increases from 15 to 100%.
(B) Increases as the temperature of the feedwater increases.
(C) Increases as the feedwater flow decreases.
(D) Increases as the temperature of the feedwater decreases.

Circle the correct letter or letters. (Answer on Answer sheet)

Also

5.7 The plant startup procedure, OP-203, recommends that the reactor be critical on a CRA configuration that allows sufficient reactivity to overcome reactivity coefficients, and Xenon, between 0 to 100% power.

a. What are three reactivity coefficients that must be overcome? (.75)

b. How do these coefficients add negative reactivity? (Include load range (power level) over which they act.) (.75)

5.8 List four conditions which, if observed to be within specifications, will ensure that the hot channel factor requirements are satisfied. (2.0)

5.9 During a plant heatup, one step of OP-202 calls for opening the startup FW block valves and manual bypass valves before reaching 180°F to assure that mini flow bypass exists prior to reaching 180°F. Explain the reason for performing these actions. (1.0)

5.10 Of the following operations, which will have a negative effect on the available Net Positive Suction Head (NPSH) of a given centrifugal pump (select one): (1 0)

a. Throttling open the pump's suction valve.

b. Throttling open the pump's discharge valve. (MOST CORRECT)

c. Decreasing the pump's speed.

d. Decreasing the temperature of the fluid being pumped.

5.11 TRUE or FALSE

a. Nucleate boiling provides better heat transfer than subcooled forced convection. (.5)

b. Film boiling provides better heat transfer than nucleate boiling. (.5)

5.12 During a startup from xenon free conditions with constant temperature, reactor power is leveled at 10^{-8} amps and then rapidly increased to 10^{-7} amps and leveled. Which of the statements below is true regarding the relative rod position before and after the power rise (select one): (1.0)

a. The rod position at 10^{-7} amps is the same as the rod position at 10^{-8} amps.

b. The rod position at 10^{-7} amps is higher than it was at 10^{-8} amps by an appreciable amount.

c. The rod position at 10^{-7} amps is lower than it was at 10^{-8} amps by an appreciable amount.

5.13 TRUE or FALSE

a. Differential Boron Worth is greater at higher temperatures. (.5)

b. The moderator temperature coefficient (MTC) becomes less negative with increasing boron concentration. (.5)

c. 100% FP equilibrium xenon worth is twice as much as 50% FP equilibrium xenon worth. (.5)

5.14 As a subcritical reactor nears criticality, the length of time to reach equilibrium count rate after an insertion of positive reactivity (select one): (1.0)

a. is the same as the length of time required to reach equilibrium countrate after an equal insertion of negative reactivity.

b. increases, primarily because of the increased population of delayed neutrons present in the core.

c. decreases because the source neutrons are becoming less important in relation to total neutron population.

d. increases because of a larger number of neutron life cycles required to reach equilibrium.

5.15 Assume a reactor trip from 100% power. Compare the change in pressurizer level response with and without the 125 psi header bias in the ICS. Begin with normal pressurizer level at full power and show by calculation, how much the level will drop with and without the bias. (Do not include any operator action.) (2.0)

6. Plant Systems Design, Control and Instrumentation (25)

6.1 As part of a special test procedure, while in mode 3, the control room operator is directed to manually actuate "RB Isolation and Cooling."

a. What additional actuations, if any, can he expect? (.5)

b. Briefly outline the steps required to clear the actuation. (.5)

6.2 With regard to the Nuclear Service Closed Cycle Cooling System:

a. Assume SWP-1C is the normally running pump. What automatic actions occur if:

1. SWP-1C trips (include approximate setpoint)? (.5)
2. Upon receipt of an ES signal (consider SWP system only)? (.5)

b. What auto action(s) occur if booster pump SWP-2A trips (include setpoints)? (.5)

c. How does an ES signal affect the Nuclear Services booster pumps? (.5)

6.3 Match the following lights and switches (A-E) on the Diamond Panel with the brief explanations (1-5) of their purpose: (1.25)

(A) Latch IM-Limit Byp	(1) Clears conditions such as Asymmetric rods, out of inhibits programmer lamp malfunctions, etc.
(B) Fault Reset	(2) Used to cross connect Auxiliary power supply and DC hold bus.
(C) Motor Fault	(3) Will reclose trip breakers only when CRD groups are at in-limit.
(D) Trip Reset	(4) Allow CRD motors to be driven in insert direction past the electrical in-limit.
(E) Clamp/Clamp Release	(5) Shows power supply programer running improperly.

6.4 In the Turbine bypass valve control circuitry of the ICS, the real header pressure error or either of two bias' are used. List the specific signals or permissives required for the:

a. +50 psi bias (.75)
b. +125 psi bias (.75)

6.5 Following a loss of Instrument Air, give the failure position of the following valves ("opened," "closed," or "as is")

a. FWV-39 (40) (.5)
b. MUV-16 (RCP Seal Supply) (.5)
c. SWV-109 (CRD Cooling Inlet) (.5)

6.6 A. How does the FW Pump Discharge Crossover Valve (FWV-28) respond to the following:

1. Actuation of only one of the four steam rupture matrix. (.5)

2. After reset of steam rupture matrix, both main FW pumps tripped. (.5)

B. With both FW pumps running and FWV-28 closed, what is the signal (include setpoint) for the valve to open if one FWP trips? (.5)

6.7 With the Reactor Control and Diamond Station in manual, Tave control is transferred to feedwater, if feedwater can accept it. Select the correct logic (BOTH or EITHER) for the following three conditions in which feedwater is unable to accept Tave control?

a. Both/Either OTSG's on level control (.25)
b. Both/Either OTSG on a BTU Limit (.25)
c. Both/Either FW Loop masters in manual (.25)

6.8 Match the following automatic actions with the appropriate Radiation Monitoring System alarms. (NOTE: All of the automatic actions for a given radiation monitor may not be listed.) (More than one answer may be correct.) (1.25)

(A) RM-A1	(1) Trips control complex fans AHF-17A and 17B
(B) RM-A2	(2) Closes dampers D-29 and D-36, WGDT area supply and exhaust dampers
(C) RM-A3	(3) Stops AHF-11A and 11B (Aux. Bldg. air supply fans 3A and 3B)
(D) RM-A4	(4) Closes supply and exhaust valves AHV-1A, 1B, 1C and 1D
(E) RM-A5	(5) Stops AHF-10 (SF Area Supply Fan)

6.9 With regard to the Emergency Diesel Generators

a. (True or False) The air start systems between the two diesels are interconnected by means of an automatically operated valve. (.5)

b. (True or False) When the diesel-generator is running alone (not paralled to the system), the governor speed droop should be set on zero. (.5)

c. (True or False) The local start pushbutton (located on the diesel gauge board) will not work when the control room AUTO/MAN switch is in AUTO. (.5)

d. (True or False) The Diesel will start on an ES or UV condition when the control room AUTO/MAN switch is in MAN. (.5)

e. When the diesel is given a control room start signal, what is indicated by the following lights?

1. CRANK (Yellow) (.25)
2. READY (White) (.25)

6.10 TRUE or FALSE:

a. The Decay Heat Closed Cycle Cooling (DHCCC) Surge Tanks are pressurized with N^2 to ensure sufficient NPSH for the DHCCC pumps. (.5)

b. Because the LPI pumps may potentially be taking a suction from the RB sump, its mechanical seal flushing water is not supplied from its own discharge. (.5)

c. The pressurizer spray nozzle may be supplied by either Decay Heat pump. (.5)

6.11 What are the steam supplies to the main feedwater pumps, and explain when each is used. (1.0)

6.12 TRUE or FALSE:

a. Decreasing the amperage discharge from a station battery by 50% more than doubles the length of time that the battery's charge will last. (.5)

b. A battery charger can fully charge a battery within 24 hours, even while carrying maximum steady state dc loads. (.5)

6.13 a. List five (5) of the seven (7) areas that receive deluge fire protection. (1.0)

b. What general areas are protected by halon (FE-1301) systems, and by what means are those systems actuated? (1.0)

6.14 There are two methods available for filling the condensate storage tank, one is to fill it directly from the demineralized water system. Explain the other method and why it would be perferred. (.75)

6.15 a. The Source Range instruments will supply a rod withdrawal hold. Under what conditions will this occur, and when is it bypassed? (1.0)

b. What conditions are required for automatically de-energizing the source range high voltage? (1.0)

6.16 TRUE or FALSE:

a. If a strip chart recorder looses the 118 volt AC input, it will fail "as is" even though the input signal is still present. (.5)

b. A resistance temperature device that fails open will indicate a low or minimum temperature. (.5)

c. A thermocouple that has been shorted will indicate a temperature close to the ambient temperature at the point being shorted. (.5)

d. The fact that a tank level instrument reads erroneously low and a flow instrument reads erroneously high could be due to a ruptured bellows in each of the instrument's differential pressure (DP) detectors. (.5)

6.17 TRUE or FALSE:

a. A "block loading" sequence is initiated upon HPI actuation whether or not the diesels are supplying the ES 4160 V buses. (.5)

b. The RB spray pumps start upon an HPI actuation, but the RB spray valves do not open until RB pressure reaches 30 psig. (.5)

c. The RPS 4 psi RB pressure switches also give input to the ES actuation system. (.5)

7. Procedures - Normal, Abnormal, Emergency and Radiological Control (25)

7.1 a. According to Reactor Startup Procedure (OP-210) under what conditions shall the RCP Power Monitors be bypassed? (.5)

b. Why is bypassing these monitors required? (.5)

7.2 A limit and precaution in OP-204 says the following:

"Do not change the OTSG startup level transmitters on both OTSGs at the same time."

What is the reason for this statement? (1.0)

7.3 During full power operation, instrument problems cause the following malfunctions:

a. One MSIV closes (.5)
b. Two MSIVs close (.5)

According to OP-204, what must you do with the reactor in each of the above cases?

7.4 Fill in the following blanks.

The maximum weekly radiation exposure is __1__ mrem. Exposures up to __2__ mrem may be authorized by __3 (Title)__. Requests for exposure greater than (2) will require completion of Form 912801 and approval by __4 (Title)__. Personnel will not be allowed to receive more than __5__ mrem in any one week, except in cases of special or emergency exposure. (1.0)

7.5 During the midnight shift on Sunday, a fire develops in the area of the Turbine Lube oil sump. The reactor is at 24% power and you are coming on line after an outage. Assume no other communications will be available for the next ½ hour as the small shift manning is fighting the fire.

a. As NSS on duty, what action will you take with regard to:

1. Turbine operation (.5)
2. Reactor operation (.5)
3. Fire brigade help (.5)

b. How would you classify this event? (.5)

7.6 While operating at full power, a group 7 CRA drops into the core.

a. List five symptoms of this malfunction. (1.0)
b. List your required immediate actions. (1.0)

7.7 During normal operation, the operating makeup pump trips. List the required immediate actions. (1.0)

7.8 During refueling operations:

a. What three requirements must be met before disengaging from a fuel assembly placed in the core? (1.0)

b. Describe the interlocks built into the refueling equipment to prevent inadvertant disengagement? (1.0)

7.9 Due to an OTSG Tube Rupture, a reactor trip has occurred. The actions of EP-390 discusses when and when not to trip the RCPs.

a. When must they be tripped? (.5)
b. When should they not be tripped? (.5)
c. Discuss how depressurization is accomplished with and without the RCPs. Include limits on rate of cooldown. (1.0)

7.10 a. When on Decay Heat Removal (OP-404) with DHV-3 or DHV-4 open and one (1) makeup pump in operation, pressurizer (Pzr) level must not exceed _____ (select one): (.5)

1. 290 inches

2. 60 inches

3. 220 inches.

b. What is the reason for limiting the Pzr level while DHV-3 or DHV-4 is open? (.5)

7.11 a. When is it permissible to operate a control rod, not known to be free running, in "Jog" speed? (.5)

b. Why must reactor power be greater than 5% (NI power signal to ICS) prior to shifting the CRD control panel to "auto." (.5)

7.12 TRUE or FALSE:

a. The alternative RC pump venting procedure of the Plant Heatup procedure (OP-202) permits venting RC pumps with RCS temperature greater than 200°F. (.5)

b. When first starting Reactor Coolant Pumps (RCPs) with a Decay Heat pump operating, one RCP may not be run for more than 10 minutes without starting a second pump in the same loop. (.5)

c. If when venting from the central Control Rod Drive (CRD), in accordance with OP-202, no gas is observed; then it is not necessary to vent any more CRDs. (.5)

d. During deboration, having Grp 1 safety rods withdrawn is sufficient. But for heatup all four (4), safety groups must be withdrawn. (.5)

7.13 At what values of the parameters given below should the reactor be tripped? (1.75)

1. Control Rod Stator Temperature

2. Reactor Power if the turbine has tripped

3. Pressurizer level (increasing)

4. Seismic recorder (No. of g's)

5. T_{Hot} (increasing)

6. RC Pressure (increasing)

7. RC Pressure (decreasing)

7.14 TRUE or FALSE:

a. To save time during a reactor startup, OP-210 (Reactor Startup) allows simultaneous deboration and withdrawal of the safety groups. (.5)

b. Prior to any rod withdrawal, source range NI indication should be greater than two cps; however, source range indication is not required for boron dilution. (.5)

c. The consequence of misalignment of a Group 8 rod > ± 6.5% from the rest of its group is the same as the consequences of misalignment of a Group 7 rod > ± 6.5% from the rest of the group. (.5)

7.15 You must not attempt to move regulating rods in the sequence mode with safety rods on the auxiliary supply when in "Safety Rods Bypass." Why? (.5)

7.16 To conduct emergency boration, Letdown should be (select one): (.5)

a. Secured to minimize dilution of the MUT.

b. Diverted to an RCBT to minimize dilution of the MUT.

c. Established at greater than some minimum specified value.

d. Left as is.

7.17 List the four indications that indicate natural circulation has been established (listed in VP-580). (1.0)

7.18 A steam generator tube rupture has occurred. Under what three conditions is using an emergency cooldown rate permissible? (.75)

7.19 List the "immediate" actions (remedial actions not required) of the Reactor Protection System Actuation procedure (AP-580). (1.0)

7.20 The Engineered Safeguards System Actuation procedure (AP-380) lists criteria for determining when to stop HPI. State these criteria. (1.0)

8. Administrative Procedures, Conditions and Limitations (25)

8.1 In order to assure that redundant or diverse decay heat removal methods are available during all modes of operation, list three requirements that must be met prior to removing a decay heat train from service. (1.5)

8.2 According to the OSIM, when equipment is returned to service, can the "out of service classification" (stickers removed, log entries made, etc.) be removed with surveillance outstanding? Explain. (1.0)

8.3 While operating at 100% FP, MUP C develops a leak in its casing vent valve and is declared inoperable. Assuming normal plant configuration:

a. Are you in violation of any applicable Tech Specs? Explain your answer. (1.0)

b. As the NSS, list three actions you should take to insure compliance with all requirements. (.75)

8.4 As the NSS or ANSS, briefly describe the procedure and your responsibility for "Independent Verification." (1.0)

8.5 Answer the following, True or False, with regard to EM-207, "Reporting Requirements on Emergencies." <u>If false</u>, briefly explain how to make it a true statement.

a. During an emergency <u>drill</u>, when making a telephone notification, you can leave a message with a secretary. (.5)

b. Notification must be made to the NRC within one hour whenever the reactor trips. (.5)

8.6 <u>TRUE or FALSE</u>:

a. A weekly surveillance scheduled for Monday will be delayed until Tuesday and still be within Tech Spec tolerance. (.5)

b. If this weekly surveillance was delayed one day for each of three weeks (performed on Thursday of the third week), it would be out of tolerance. (.5)

8.7 With regard to Tech Specs concernding Electrical Power Systems:

a. Should the diesel be declared inoperable if the AC fuel transfer pump is out of service? Explain. (.75)

b. If one diesel is inoperable, in addition to demonstrating operability of the other diesel, what other surveillance test is required within one hour? (.75)

c. To demonstrate operability of the remaining diesel, is it necessary to perform a load test of it? Explain. (.75)

d. If one diesel is inoperable, must all of the Engineered Safeguards equipment supplied by the diesel be declared inoperable? Explain. (.75)

8.8 Frequent mention is made in the ACTION Statements of Tech Specs that "The provisions of specifications 3.0.3 and 3.0.4 are not applicable." The first, 3.0.3, gives you directions on what to do when an LCO is not met. Briefly describe what is specified in 3.0.4. (.75)

Delete Identical to 8.16

8.9 ~~The OSIM requires the NSS to perform five functions in the event of a reactor trip or plant shutdown. List these five functions.~~ DELETE ~~(1.25)~~

8.10 With respect to fire protection.

a. List three instances in which a continuous fire watch is required. (.75)

b. How do you ensure that a qualified fire brigade is onsite at all times? (1.0)

8.11 For each of the following RCS leak locations, gives the maximum allowable Tech Spec leak rate.

a. OTSG Tube (.5)
b. Through PORV to Quench Tank (.5)
c. Location Unknown (.5)
d. From all four RCP seal returns (.5)
e. Decay heat valves, DHV-1 and 2 (.5)

8.12 Define "Operational Mode 6." (1.0)

8.13 What is the minimum Technical Specification water level in the spent fuel pools and the basis for this minimum level? (1.5)

8.14 Technical Specifications requires that the containment average air temperature shall not exceed _____°F in Modes 1, 2, 3, and 4 and that at least _____ independent containment cooling units shall be operable in Modes 1, 2, and 3. (1.0)

8.15 CP-115, "In-Plant Equipment Clearance and Switching Orders" states four conditions that require PRC approval of a clearance prior to issuance. List these four conditions. (2.0)

8.16 What are the duties of the shift supervisor on a reactor trip? (2.0)

8.17 At CR-3, you have provisions for an "Immediate Temporary Changes" (ITC).

a. When can an ITC be used? (.5)
b. Who has to approve an ITC? (.5)

FIGURE
5.2.a.

CURVE 3.15

CONTROL ROD GROUPS 5-7 INTEGRAL REACTIVITY WORTH
100% FP, EQUILIBRIUM XENON, CRG 8 AT 28.8% WD

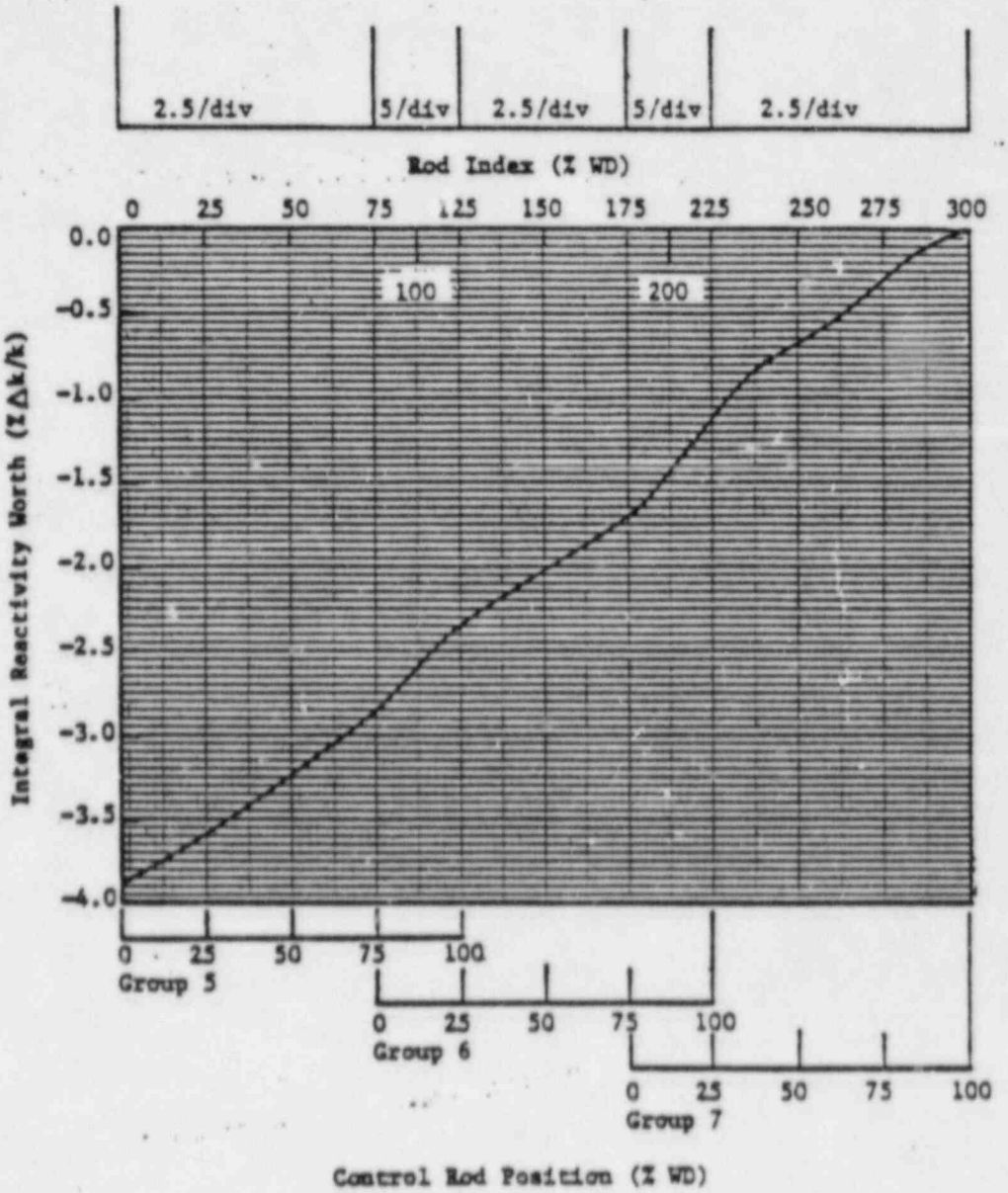
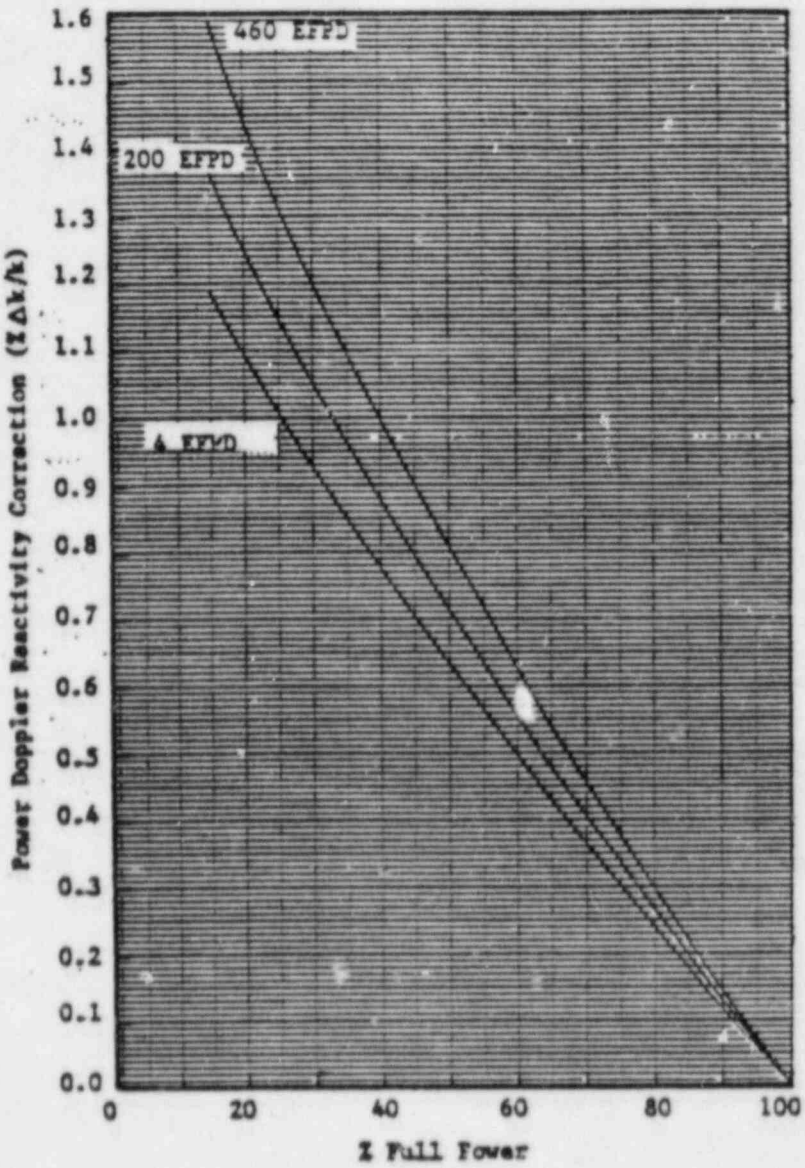


FIGURE 5.2.k.

CURVE 3.17

POWER DOPPLER REACTIVITY CORRECTION VERSUS POWER LEVEL

Reference Conditions: 100% FP, Nominal HFP Rod Positions, Equilibrium Xenon, HFP Samarium



5. Theory of Nuclear Power Plant Operation, Fluids and Thermodynamics (25)
ANSWERS

5.1 Ref: T/S B3/4.1

Basis of SDM

a. EOL; MTC is most negative due to low boron concentration.

b. No-load Tave (Hot zero pwer - 532°). FSAR-density of moderator

c. SDM $\geq$1% ΔK T.S. 3.1.1.1.1

5.2 a. Curve 3.17

Power doppler = 0.76% from 50 to 100%
0.14% from 90 to 100%
= .62%

.8
−.14
.66 % $\Delta k/k$

Curve 3.15
Rod Index 220 ~ 20% w/d on Gp 7 = 1.15%
~ = .62%
.53%

−1.2
+.66
.54% = 267.5 % w/d

From Curve 3.15, 0.53% Δk is approximately equal to rod index of 267

b. In for 4-6 hours due to Xe burnup, then out as Xe builds into new equilibrium level for 90%

5.3 a. OP-204 (Top-Bottom)

Gp 7 less than 25% w/d, More negative, rods and cold water

b. OP-204

If power imbalance is negative, APSR's are inserted
If power imbalance is positive, APSR's are withdrawn

5.4 STM 24-5

a. 1. Extraction
2. Main

b. 1. Insure proper heatup of L.P. Tubine
2. Keep L. P. metal temperature and steam temperature differential at a minimum

c. ↑ (const. until superheated) (increase)
↑ (to 100% then →) (increase) (then 100% remain the same)
↑ (increase)
↑ (increase)

5.5 Ref: Oconee submitted question

1. ↑ (increase)
2. ↓ (decrease)
3. ↑ (increase)
4. ↑ (increase)

5.6 Ref: Oconee submitted question #150

A & D

5.7 Ref: CR3 submitted Question 5.39.

a. doppler, moderator temp and voids

b. doppler - 15-100% predominant ~~- as full~~ 0 To 100% is correct temp increases resonance peaks of the resonant absorbers widen causing more neutron absorbing and decreasing neutron population therefore, adding negative reactivity.

voids - as voids from in the coolant, the neutrons remain in the epithermal range longer and more resonant capture occurs. 15-100%.

moderator temp - 0-15%, as coolant heats up its density decreases and the neutrons remain epithermal longer having a greater chance of leaking out or being absorbed.

5.8 Ref: T.S. B3/4 2-2 (.5 each)

1. Control rods in a single group move together
2. Reg. Groups sequenced with overlapping as required
3. Reg. Groups and APSR insertion limits maintained
4. Axial Power Imbalance Limits Maintained

5.9 Ref: OP-202

Water hammer problem typically occurs in the 210 to 230°F Temperature range. Prevent thermal shock of FW nozzles.

5.10 b

5.11 a. True
b. False

5.12 a

5.13 a. False, Curve 3.2A
b. True, Curve 3.6
c. True, Curve 3.12A

5.14 d

5.15 100% Tave = 579°
No-load Tave = 532°
Tave w/125 bias = 557°

ΔT with bias = 22°
ΔT w/o bias = 47°
Pzr level = 5.5"/°F (Tave)
Normal Operating Level = 200 inches.

6. Plant Systems Design, Control and Instrumentation (25)
ANSWERS

6.1 Ref: CR3 Submitted Question 8.3

a. No other actuations - manual RBISO signal will not actuate HPI or LPI.

b. Depress the "RBISO & Cooling" Manual Test Reset Pushbutton.

6.2 STM-23-4

a. 1. SWP-1B starts on low header pressure of 100 psig, if <110 after 10 sec., "A" pump starts.
2. SWP-1C stops 15 sec later, due to a pressure switch, SWP-1A and 1B auto start.

b. STM-23-7

Idle pump, SWP-2B auto starts on low flow of 140 GPM.

c. STM-23-7 No effect

Supply and return valves will close to CRDM coolers. Booster pumps must be manually stopped.

6.3 Ref: STM 12-16

(A) - (4)
(B) - (1)
(C) - (5)
(D) - (3)
(E) - (2)

6.4 Ref: STM 13 - 16

a. Turbine synchronized (requires turbine not tripped signal (from Auto Stop oil), all bypass valves closed, header pressure error ≤10 psi; ULD must be ≥15% ~~with bypass valves closed~~ with Turb. not Tripped

1. Turb not Tripped
All bypass valves closed
header press ≤ 10
OR
Turb not Tripped, ULD ≥ 15%

Ref: ICS Analogs & Digitals

b. Whenever reactor is tripped as indicated on the Diamond Control Panel.

6.5 a. Ref: (Dwg 302-081) - FWV-39(40) (FAI).

b. STM-17 (FAI).

c. (302.601) (FC).

6.6 Ref: STM 27 - 56

a. 1. Any one of 4 matrix will close this valve.
2. On reset, valve will open if both main FW pumps are tripped.

b. <55 psi control oil pressure (MFWP Trip).

6.7 Ref: Oconee Question #13

1. Both OTSG's on level control.
2. Either OTSG on a BTU Limit.
3. Both FW Loop masters in manual.

6.8 Ref: AP-103

(A) - (4)
(B) - (3) + (5)
(C) - (2) + (3) — Ref AP-243 pg 2-
(D) - (5)
(E) - (1)

6.9 Ref: STM-10

a. (10 - 5) False - later connected by 2 manually operated valves.

b. True (STM 10 - 37).

c. True (STM 10 - 39).

d. False (STM 10 - 39).

e. STM 10 - 42.

1. 150# air being supplied to air control valve.
2. Generator at rated voltage and frequency, output breaker is open.

6.10 a. True, 5 to 10 psi N_2. Ref. STM 20-8.

b. False, discharge is run through a cyclone separator.

c. True, manual cross-connects DHV 7&8. Ref. STM 20-11 and 302-641 Sh. 1.

6.11 Ref. Sample question 2-6 #50

Reheat steam - when reheat pressure > auxiliary steam pressure.

Auxiliary steam - when reheat steam NA or < auxiliary steam pressure.

Main steam - when reheat and auxiliary steam pressure is insufficient to maintain pump speed.

6.12 a. True, STM 15-9.

b. True, STM 15-9.

6.13 a. Startup Transformer
Transformers 3-1 3-2 3-3 - (Transformers - OK)
Unit aux Transformer
Charcoal Plenums, Aux Building and Control Complex + Rx Bldg.
Main Turbine LO
Main Feed Pump Oil Console
Hydrogen Seal Oil Unit
Tech Support Center

Ref. STM 38-3.

b. FE-1301 protects the cable spreading room in the control complex and is actuated by smoke detectors. Ref. STM 38-5. (May talk about one detector from each of two strings.)

6.14 Ref sample question 2-6 #61.

The second method of filling the condensate storage tank is through CDV-113 which puts demineralized water into the condenser, the increasing hot well level causes CDV-88 to open thus filling the tank. Preferred because:

1. Water is deaerated when sprayed into the condenser,

2. Water is routed through the condensate polishing demineralizers prior to going to the tank.

6.15 Ref. STM 6-10, 6-11.

a. A rod withdrawal inhibit will be inserted at 2 DPM SUR. This inhibit is blocked when above 10% in the power range.

b. Both IR > 10^{-9} amps or NI 5 or 6 and MI 7 or 8 $\geq$ 10% FP.

6.16 a. (False) Check at Facility, Ref. STM 7-25.

b. False, Ref. STM 7-26.

c. True, Ref. STM 7-27.

d. False, Ref. STM 7-28.

6.17 a. True, STM 11-9.

b. False, STM 11-14.

c. False, STM 11-4.

7. Procedures - Normal, Abnormal, Emergency, and Radiological Control (25)
ANSWERS

7.1 Ref: OP-210, page 3 : Tech Specs do not permit this

a. <40% Power See pg 3/4 3-3 Amd. 56

Switchover between startup and Unit Aux. Transformers Energizing or deenergizing an RCP.

b. Prevent reactor trip on loss of RCP signal when switching transformers.

7.2 Ref: OP-204, page 8

To do so could result in a reactor trip on lo-lo SG level. (OP-203) level ≤18" in both OTSG's could cause EFW to start and result in severe transient.

7.3 Ref: OP-204, page 7

a. Manually reduce power to 60%.

b. Trip the reactor.

7.4 Ref: RP-101, page 9 and 10

1. 300
2. 600
3. Chem Rad Super
4. Nuclear Plant Manager
5. 2 Rem (2000 mrem)

7.5 Ref: CR3 submitted question

a. 1. Run turbine back at max rate and trip in at ≤15%.
2. Maintain reactor critical POAH.
3. Immediately activate on-site Fire brigade.

b. If ≥10 minutes; Unusual Event.

7.6 Ref: EP-~~210~~ 542; Pg ~~4~~ 1 and 2

a. Deviation alarm from plant computer.
Single fault lite on PI panel.
"ASXMM RODS" On Diamond.
"In-Limit" light on Diamond.
"In-Limit" light on PI.
Probable decrease in Rx power, temp, and/or press.
Probable QPT.

b. Insure auto actions.

Manually run back any ICS station not in auto Run back power to ≤60% of allowable pump combination.

7.7. Ref: AP-~~115~~ ? No longer valid proc.

IMMED ACTIONS:

1. Close MUV-16 and establish minimum letdown.
2. Insure MUV-64 is open.
3. Start standby MUP.

7.8 Ref: CR3 Submitted Question, FP-203

a. 1. Z-Z Tape reading confirmed, stable count rate established.
2. Low load limit.
3. Permission from Control room refueling operator, stable count rate established.

b. Electrical Interlock - disables solenoids controlling hydraulic fluid flow to grapple fingers.

Two Mechanical Interlocks - Both prevent grapple from disengaging when weight of fuel assembly is applied.

7.9 Ref: EP-390: New Revision

a. If not manually controlling the depressurization and cooldown of the RCS and 1500 psig ES occurs.

b. If manually controlling depress/cooldown and 50° subcooling margin is being maintained - bypass ES and do not trip RCP's upon reading 1500 psig.

c. With RCP's

Within 30 min. depress/cooldown to ≤1000 psig and 500°F using both OTSG's and Pzr spray.

Can exceed 100°F/hr on Pzr but maintain 20°F margin to saturation

<u>Without RCP's</u>
Use PORV

7.10 Ref. OP-404, p. 5.

a. 3.

b. Limits the potential for overpressurization of the DH system.

7.11 Ref. OP-502 p. 6 item 4.29
OP-502 p. 4 item 4.15.

a. For the purpose of latching the CRDM to the lead screw when the rod is known to be the lower limit of travel.

b. Transfer to "auto" at a very low power level could result in a continuous rod withdrawal signal.

7.12 Ref. OP-202.

a. False, p. 26 and 30

b. True, p. 27

c. True, p. 29

d. False, p. 4, item 4.2 and p. 38.

7.13 1. 180°F Ref: AP-521, p.3

2. 20% FP Ref: AP-660, p.2

3. 290 inches Ref: AP-660, p.3

4. $\geq$ 0.5 g Ref: AP-961, p.2

5. $\geq$ 618°F Ref: VP-580, p.2

6. $\geq$ 2300 psig. "

7. $\leq$ 1800 psig. "

7.14 a. False, Ref. OP-210 p. 2 item 4.7 p. 6 item 6.2.5.1
OP-202 p. 4 item 4.2

b. False, Ref. OP-502 p. 13 OP-304 p. 5 item 4.5

c. False, Ref. OP-502 p. 5 item 4.2
Tech Specs 3/4 1-18 3/4.1.3.

7.15 Ref. OP-502 p. 18 item 12.5.1.1

Because of the possibility of moving both a Safety Group and Regulating Group at the same time.

7.16 c.

Ref. EP-140, p. 2 of 3, item 1.a.

7.17 Ref. VP-580 p. 7 of 19 item 2.5

Tc approximately equal to T_{sat} at OTSG.

Delta T develops and stabilizes.

Average of 5 highest incore thermocouples ~~flow~~ (Follow) T_h within 10°F.

When OTSG pressure is lowered, T_h, T_c and incore thermocouples lower.

7.18 Ref. EP-390 p. 7 of 11 item 15

If main condenser is not available.

or

HPI is requires to maintain Pzr level. (beyond capacity of normal makeup)

or

RCPs are Not operating.

7.19 Ref. AP-580 p. 2-4 of 11

Press "Reactor Trip" push button.
Observe "Trip Confirm Light" lit on diamond panel.
Ensure turbine TVs and GVs fully closed.
Ensure main block valves closed.
Ensure low load block valves closed.
Ensure Pzr level $\geq$50"/
Close MUV-51 letdown block orifice bypass.
Ensure STM HDR PRESS controlling at 1010 psig.
Ensure GEN output BKRs open.

7.20 Ref. AP-380 p. 12 of 25 item 18

Adequate subcooling margin
Pzr level $\geq$50"
OTSG heat removal capability
or
LPI flow $\geq$1000 gpm in each train >20 minutes.

8. Administrative Procedures, Conditions and Limitations (25)
ANSWERS

8.1 Ref: OSIM, Paragraph B.2, page VI-2

a. No more than one decay heat train shall be removed from service at any one time (and)

b. The requirements for voluntarily entering a degraded mode of operation listed in CP-115 have been met (and)

c. The refueling transfer canal is flooded or at least one OTSG is available for cooling, either by forced flow or natural circulation.

8.2 Ref: OSIM, Pg. III-9

Yes; providing functional tests have been completed.

8.3 Ref: CR3 submitted question 8.6

a. Yes; MUP A&B are both normally powered from ES 4160V Bus A. Thus only one MUP is operable.

b. 1. Enter Action Statement.
2. Prepare NCOR.
3. Insure MUP-1B BKR is positioned in 'B' bus cubicle and selected for ES start.

8.4 Ref: OSIM, B.1, Pg. VI-1

a. NSS or ANSS stamps two copies of applicable lineups.

b. Person restoring system lineup shall use one stamped copy as a checkoff of the alignment performed.

c. Second stamped copy to be used by another person.

d. Staple two completed copies together - NSS reviews for completeness and accuracy - forwarded to Quality Files.

8.5 Ref: Em-207

a. False - "cannot" (not considered a complete notif.)

b. ~~False~~ TRUE - "and RCS is less than 50° subcooled"

(May be true - required by OSIM) Pg. IV-4, must notify NRC Bethesda & Res. - not necessarily within one hour.

8.6 Ref: T/S 3/4 0-2

a. True (25% of interval)

b. True (max of 3.25)

8.7 Ref: T/S 3/4 8-4

a. T/S says verify the fuel transfer pump..., there is a backup DC pump.

b. T/S 3/4 8.1; Demonstrate operability of offsite power sources (surv. Req. 4.8.1.1.1a) SP-321 & 322.

c. T/S 3/4 8-4; No, only that it starts from ambient and accelerates to 900 rpm in $\leq$10 sec.

d. No, TS 3.0.5 applies (except in modes 4 and 5)

8.8 T/S 3/4 0-1

Entry into an operational mode shall not be made unless the LCO is met without reliance on the ACTION statement

8.9 Ref: OSIM: CR3 Submitted Quest.

1. Pg. IV-4, Insure plant is placed in a safe condition - operations performed procedures.
2. Notify NOS or man on call - Ops Super, OTA, NRC.
3. Determine subsequent action.
4. Complete step → 8 of Rx trip and shutdown report.
5. Insure Rx trip info is logged in RO and SS logs.

DELETED

8.10 Ref: CR3 Submitted Quest

a. 1. When one or more of the required deluge and sprinkler systems are inop.

2. Halon system inop.

3. When a penetration fire barrier protecting safety-related areas is not functional.

b. At the beginning of each shift, each fire brigade member is notified and his name is logged on fire brigade master sheet.

8.11 Ref: T/S 3/4 4-15

a. 1 GPM
b. 10 GPM
c. 1 GPM
d. 10 GPM
e. (Table 3.4-2) 1 GPM acceptable up to 5 GPM

8.12 Ref: CR3 submitted Question 6.16

Refueling $\leq$0.95 Keff, 0% thermal power (excluding decay heat), $\leq$140°F coolant temperature, reactor vessel head unbolted or removed and fuel in the vessel.

8.13 Ref: CR3 submitted Question 6.26

The minimum water level is 23 feet and is required to ensure that sufficient water depth is available to remove 99% of the assume 10% iodine gap activity released from the rupture of an irradiated fuel assembly.

8.14 Ref: CR3 submitted Question 6.55

130°F and at least 2.

8.15 Ref: CR3 submitted Question 8.2

The PRC shall approve any Clearance prior to issuance which meets any condition specified below:

a. The Clearance is to be issued for an unusual, non-routine, or abnormal evolution (i.e., repair of RCV-11 in other than Mode 5 or 6, and other emergency repairs).

b. The Clearance to be issued cannot meet the double valve protection guidelines of 500 psig and/or 200°F and $\geq$1/2 in. diameter opening.

c. The Clearance to be issued cannot meet the ES train separation criteria.

d. The Clearance to be issued cannot meet the limiting conditions for voluntarily entering a degraded mode of operation.

8.16 Ref: CR3 submitted Question 8.16

a. Insures that the plant is placed in a safe condition by having the necessary operations performed in accordance with approved procedures.

b. Notifies the SOTA, Nuclear Operations Superintendent, or person on call, and the NRC (Red Phone), and the NRC Resident Inspector.

c. Determines the subsequent action to be taken.

d. Completes Steps 1 through 9 of Reactor Trip and Shutdown report; assigns the next consecutive report number and forwards it to Nuclear Operations Superintendent for disposition.

e. Insures the reactor trip information is entered in the Reactor Operator's Log and Shift Supervisor's Log.

8.17 Ref: CR3 submitted Question 8.19

a. ITCs are normally of an urgent nature such that time and/or plant conditions necessitate implementation of changes prior to the time required by other procedure change approval methods.

ITCs are used to correct obviously incorrect value lineups, sequence of procedure steps out of order, incorrect instrument specified in procedure.

ITCs are normally used on a one time basis and shall not change facility design or intent of the procedure.

b. ITCs are approved by Nuclear Shift Supervisor on Duty and a Responsible Section Superintendent/Supervisor or when available a Nuclear Operations Technical Advisor. (SOTA)

they Maintain that ANSS is a Responsible Section Supervisor

ANSS is a Responsible Ops Section Super.