

ENCLOSURE 1

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-285/95-13

License: DPR-40

Licensee: Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
P.O. Box 399, Hwy. 75 - North of Fort Calhoun
Fort Calhoun, Nebraska

Facility Name: Fort Calhoun Station

Inspection At: Fort Calhoun, Nebraska


Inspection Conducted: December 4-8, 1995

Inspectors: Thomas Meadows, Chief Examiner, Operations Branch,
Division of Reactor Safety

Ryan Lantz, Examiner, Operations Branch,
Division of Reactor Safety

David Pereira, Examiner, Operations Branch,
Division of Reactor Safety

Approved:


Joseph I. Tapia, Acting Chief, Operations Branch,
Division of Reactor Safety

12/26/95
Date

Inspection Summary

Areas Inspected: Routine, announced inspection of the qualifications of applicants for operator licenses at the Fort Calhoun facility, which included an eligibility determination and administration of comprehensive written and operating examinations. The examination team also observed the performance of on shift operators and plant conditions incident to the conduct of the applicant evaluations. The facility volunteered to participate in a pilot initial examination process which principally involved facility development and NRC administration of the initial examinations. Guidance for conduct of the pilot examinations was contained in Generic Letter 95-06 and Attachment 1 to Regional Office Interaction Memorandum 9525, which was used in addition to the guidance provided in NUREG-1021, "Operator Licensing Examiner Standards," Revision 7, Supplement 1, Sections 201-203, 301-303, 401-403, to develop and administer the examinations.

Results:

Operations

- All of the eight applicants for operator licenses satisfied the requirements of 10 CFR 55.33(a)(2) (Section 1).
- Scores on the written examinations ranged from a low of 81 percent to a high of 95 percent, with an average of 90 percent overall. Three areas of potential generic knowledge weaknesses were identified after analyzing the final written test results (Section 1.1).
- During the simulator examinations, the team observed generally good command and control communications, safety awareness, and systems knowledge (Section 1.2.1).
- During the walkthrough examinations, the team noted good procedure usage, and plant awareness and ownership from the applicants (Section 1.2.2).
- The facility developed examinations were challenging and discriminating, tested at the proper level, but required some revision prior to NRC administration (Section 1.1).

Summary of Inspection Findings:

- There were no findings that were assigned a tracking number identified during the course of this inspection.

Attachments:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Simulation Facility Report
- Attachment 3 - Written Examination and Answer Key

DETAILS

1 LICENSED OPERATOR APPLICANT INITIAL QUALIFICATION EVALUATION (NUREG-1021)

This inspection consisted of an evaluation of applicants for reactor and senior reactor operator licenses. The licensee volunteered to participate in a national pilot study for these examinations. The pilot study involved facility development of all initial examination material, facility administration of the written examination (not including the generic fundamentals examination), and NRC administration of the operating examination. NRC coordinated with the facility using the pilot examination guidance contained in Regional Office Interaction Memorandum 9525, Attachment 1, and Generic Letter 95-06, and granted final approval of all initial examinations to be administered at the facility.

During the inspection, the examiners evaluated the qualifications of four applicants for senior reactor operator licenses and four applicants for reactor operator licenses. The inspection assessed the eligibility and administrative and technical competency of the applicants to be issued licenses to manipulate or to direct the operation of the reactivity controls at the Fort Calhoun Station commercial nuclear power facility in accordance with 10 CFR Part 55 and NUREG-1021, "Operator License Examiner Standards," Revision 7, Supplement 1, Sections 200 (series), 300 (series), and 400 (series). Further, the inspection included evaluations of facility procedures and simulation capability used to support administration of the examinations. These areas were evaluated using the guidance provided in the areas of NUREG-1021 cited above. Finally, the examiners observed the performance of onshift operators and plant conditions during the conduct of inplant applicant evaluations.

After completion of the evaluations, the examiners determined that all eight applicants for operator licenses satisfied the requirements of 10 CFR 55.33(a)(2).

1.1 Written Examination

The facility developed and submitted the written examination to the chief examiner for review on November 6, 1995. On November 16, 1995, the chief examiner and a representative from the NRC headquarters operator licensing branch discussed revisions to the examination with the facility. Overall, the chief examiner found the as-developed examinations challenging and discriminating, testing at the proper level of knowledge, valid for a licensing decision and meeting the requirements of NUREG 1021, Revision 7, Supplement 1. However, there were some revisions required during the preadministration examination review. These revisions were primarily due to questions that contained multiple correct answers and technical specification questions considered to be non-discriminating (direct look up). The chief examiner confirmed incorporation of the revisions into the final written examination on November 24, 1995.

The facility administered and graded the approved written examination on December 4, 1995. The chief examiner reviewed the facility analysis of the examination results as required in the pilot guidance. The facility requested some post-administration revisions to the examinations. The chief examiner concurred with the facility revisions, grading, and analysis. The answer keys were finalized and the chief examiner graded the written examinations.

Scores on the written examinations ranged from a low of 81 percent to a high of 95 percent, with an overall average of 90 percent. Three areas of potential generic knowledge weakness were noted after analyzing the final written test results. These were discussed with the facility training staff for their consideration:

- * SRO/RO question 72 was missed by all eight applicants: The question tested when operators are to reference, but not enter, the emergency procedures following a reactor protection system actuation after a manual trip with Tcold at 520 degrees F.
- * RO question 97 was missed by three of the four reactor operator applicants: The question tested what design mechanism physically triggered a reactor trip due to a turbine trip at 25 percent reactor power (#1 turbine control valve failed closed).
- * SRO question 95 was missed by three of the four senior reactor operator applicants: The question tested technical specification actions for a mis-aligned control rod situation.

The licensee agreed that these three areas were generic weaknesses and processed this data into their training configuration management system. The licensee stated that additional training in these areas was planned for future licensed operator requalification training. The licensee also stated that they would check associated system procedures and training materials to see if there was a lack of information, or conflicting information, that could have caused these generic weaknesses.

1.2 Operating Examinations

The facility developed comprehensive operating tests in accordance with the pilot guidance and guidelines of NUREG-1021, Revision 7, Supplement 1, Section 301. The operating tests consisted of three parts: an administrative portion, a dynamic simulator scenario portion, and a control room/plant walkthrough portion. The chief examiner reviewed and validated the various portions of the operating tests at the Fort Calhoun Station facility during the week of November 6, 1995. The licensee's personnel, under security agreement, assisted in the onsite validation. The examination team administered the operating tests during the week of December 4, 1995.

1.2.1 Dynamic Simulator Scenarios

The examiners evaluated three crews consisting of two to three applicants each on two scenarios using the Fort Calhoun plant-specific simulation facility. The examiners evaluated the applicants' competencies by comparing actual performance during the scenarios against expected performance in accordance with the requirements in NUREG-1021, Revision 7, Supplement 1, Section 303.

The team observed generally good command and control, communications, safety awareness and systems knowledge. No generic weaknesses were identified.

1.2.2 Walkthrough Examinations

The examination team evaluated each of the license applicants using system oriented job performance measures related to job tasks within the scope of their potential duties, as appropriate, in accordance with NUREG-1021, Revision 7, Supplement 1. This included nonlicensed operator tasks outside the control room and performance of some tasks in the simulator in the dynamic mode. Other job performance measures were simulated through discussion in the control room and at local plant stations. Each of the applicants was required to enter the radiologically controlled area to complete one or more tasks. In addition, the examiners asked prescribed questions related to the task system knowledge. Facility administrative procedures and practices were also examined using job performance measures or questions.

The team noted good procedure usage and system knowledge during the walkthroughs. The team also observed good plant housekeeping and material condition, and plant ownership from the candidates.

While conducting walkthroughs in the main control room, the examiners observed professional conduct from the licensed operators on shift, and good control of access to the main control room.

1.3 Simulator Facility

During the preparation and conduct of the operating examinations, the examination team observed minor discrepancies in simulator fidelity, however, each of these had been identified previously by the licensee. The observed discrepancies did not impact examination validity.

ATTACHMENT 1

1 PERSONS CONTACTED

1.1 Licensee Personnel

- *W. G. Gates, Vice President, Nuclear
- *T. L. Paterson, Division Manager, Nuclear Operations
- *M. L. Lazar, Supervisor, Operations & Technical Training
- *G. M. Cook, Supervisor, Station Licensing
- *R. L. Andrews, Division Manager, Nuclear Services
- *G. E. Guliani, Operations Training
- *E. P. Matzke, Station Licensing
- *J. E. Koske, Senior Consultant
- J. Gasper, Manager, Training

1.2 NRC Personnel

- *Vincent Gaddy, Resident Inspector
- Wayne Walker, Senior Resident Inspector

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

* Denotes personnel that attended the exit meeting.

2 EXIT MEETING

An exit meeting was conducted on December 8, 1995. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee did not express a position on the findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT 2

SIMULATION FACILITY REPORT

Facility Licensee: Palo Verde Nuclear Generating Station

Facility Docket Nos.: 50-215

Operating Tests Administrated on: December 5, 1995

These observations do not constitute audit or inspection findings and are not, without further verification and review, indicative of noncompliance with 10 CFR 55.45(b). These observations do not affect NRC certification or approval of the simulation facility other than to provide information which may be used in future evaluations. No licensee action is required in response to these observations. While conducting the simulator portion of the operating tests, the following unidentified discrepancies were observed:

ITEM

DESCRIPTION

None

ATTACHMENT 3

WRITTEN EXAMINATION AND ANSWER KEY

**U. S. NUCLEAR REGULATORY COMMISSION
SITE-SPECIFIC
WRITTEN EXAMINATION**

APPLICANT INFORMATION

Name: <i>Key</i>	Region: I / II / III / <input checked="" type="radio"/> IV / V
Date: <i>12/04/95</i>	Facility/Unit: <i>Fort Calhoun</i>
License Level: <input checked="" type="radio"/> RO / SRO	Reactor Type: W / <input checked="" type="radio"/> CE / BW / GE

INSTRUCTIONS

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires a final grade of at least 80 percent. Examination papers will be picked up 4 hours after the examination starts.

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

Applicant's Signature

RESULTS

Examination Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

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Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

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| 052 | a | b | c | d | ---- | 077 | a | b | c | d | ---- |
| 053 | a | b | c | d | ---- | 078 | a | b | c | d | ---- |
| 054 | a | b | c | d | ---- | 079 | a | b | c | d | ---- |
| 055 | a | b | c | d | ---- | 080 | a | b | c | d | ---- |
| 056 | a | b | c | d | ---- | 081 | a | b | c | d | ---- |
| 057 | a | b | c | d | ---- | 082 | a | b | c | d | ---- |
| 058 | a | b | c | d | ---- | 083 | a | b | c | d | ---- |
| 059 | a | b | c | d | ---- | 084 | a | b | c | d | ---- |
| 060 | a | b | c | d | ---- | 085 | a | b | c | d | ---- |
| 061 | a | b | c | d | ---- | 086 | a | b | c | d | ---- |
| 062 | a | b | c | d | ---- | 087 | a | b | c | d | ---- |
| 063 | a | b | c | d | ---- | 088 | a | b | c | d | ---- |
| 064 | a | b | c | d | ---- | 089 | a | b | c | d | ---- |
| 065 | a | b | c | d | ---- | 090 | a | b | c | d | ---- |
| 066 | a | b | c | d | ---- | 091 | a | b | c | d | ---- |
| 067 | a | b | c | d | ---- | 092 | a | b | c | d | ---- |
| 068 | a | b | c | d | ---- | 093 | a | b | c | d | ---- |
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| 071 | a | b | c | d | ---- | 096 | a | b | c | d | ---- |
| 072 | a | b | c | d | ---- | 097 | a | b | c | d | ---- |
| 073 | a | b | c | d | ---- | 098 | a | b | c | d | ---- |
| 074 | a | b | c | d | ---- | 099 | a | b | c | d | ---- |
| 075 | a | b | c | d | ---- | 100 | a | b | c | d | ---- |

RO ANSWER KEY

- | | | | |
|----------------|----------------------------|-----------------|----------------------|
| (1) | A | (52) | D |
| (2) | B <i>delete</i> | (53) | C |
| (3) | B | (54) | C |
| (4) | C | (55) | C |
| (5) | A | (56) | C |
| (6) | C | (57) | C |
| (7) | C | (58) | C |
| (8) | D | (59) | D |
| (9) | A | (60) | A |
| (10) | C | (61) | C |
| (11) | C | (62) | A |
| (12) | A | (63) | B |
| (13) | B | (64) | D |
| (14) | D | (65) | A |
| (15) | D | (66) | X B |
| (16) | A | (67) | C |
| (17) | C | (68) | C |
| (18) | D | (69) | B <i>or A</i> |
| (19) | C | (70) | D |
| (20) | B | (71) | D |
| (21) | D | (72) | A |
| (22) | C | (73) | C |
| (23) | B | (74) | B D |
| (24) | D | (75) | B |
| (25) | A | (76) | C |
| (26) | B | (77) | C |
| (27) | A | (78) | A <i>or C</i> |
| (28) | C | (79) | D |
| (29) | B | (80) | C Deleted |
| (30) | B | (81) | D |
| (31) | D | (82) | D |
| (32) | B | (83) | B Delete |
| (33) | D | (84) | D |
| (34) | A | (85) | X D |
| (35) | C | (86) | D |
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| (37) | C | (88) | C |
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| (41) | C | (92) | C |
| (42) | B | (93) | B |
| (43) | A | (94) | A |
| (44) | B | (95) | A |
| (45) | C | (96) | A |
| (46) | B | (97) | B |
| (47) | B | (98) | B |
| (48) | D | (99) | C |
| (49) | B | (100) | C <i>or D</i> |
| (50) | A | | |
| (51) | B | | |

REACTOR OPERATOR EXAMINATION

QUESTION 1 1 Point

The following events occur:

- The plant is at full power.
- Rod Drive Clutches are being supplied from Instrument Buses A and C.
- Instrument Bus B is deenergized.
- The operator then inadvertently switches a clutch power supply from Instrument Bus A to Instrument Bus B.

Which one of the following describes the effect that this action will have on CEA position?

- a. No effect.
- b. The shutdown CEAs will drop.
- c. All CEAs will drop.
- d. RPS will generate a reactor trip on one channel.

QUESTION 2 1 Point

During a startup, the connection between the drive mechanism for a high worth Shutdown CEA and its poison fingers becomes uncoupled. As a result, the drive mechanism withdraws normally but all poison fingers associated with it remain fully inserted in the core. Which one of the following describes a symptom that the operators will see as a result of this event?

- a. The affected rod bottom light will remain on.
- b. The SCEAPIS will show no rod motion for that CEA.
- c. Criticality will occur below the PDIL.
- d. The ECP will predict criticality at a higher than actual CEA position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 3

1 Point

The following conditions exist:

- A reactor trip due to a loss of offsite power has occurred.
- An inadvertent SGIS occurred after the trip.
- MS-291 ('A' S/G relief) is open.
- MS-292 ('B' S/G relief) will not open.
- Pressurizer level is 50%.
- Subcooling Margin is 50°F.
- Present RCS Cooldown Rate is 100°F/hr.

Which one of the following describes the expected natural circulation patterns that will develop under these condition?

- a. No natural circulation will develop.
- b. It will develop in the A loop, the B loop will be stagnant.
- c. It will develop in the A loop, reflux boiling will develop in the B loop.
- d. It will develop in the 'A' loop but flow will occur in both loops.

QUESTION 4

1 Point

Which one of the following describes the automatic operation of PCV-1753 (Instrument Air/Service Air Cross Tie)?

- a. It closes if service air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- b. It closes if service air pressure decreases to 80 psig but must be reopened manually.
- c. It closes when instrument air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- d. It closes when instrument air pressure decreases to 80 psig but must be reopened manually.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 5

1 Point

The following conditions exist:

- A LOCA has occurred.
- All HPSI pumps are injecting.
- PPLS has been reset.
- Containment spray is in operation.
- Containment pressure is 6 psig.
- The current source of water is the containment sump.
- RAS has not been reset.

Resetting RAS under these conditions will result in which one of the following consequences?

- a. Potential damage to the lockout relays.
- b. It will be possible to start the LPSI pumps.
- c. The containment spray pumps will trip.
- d. The water source will swap back to the SIRWT.

QUESTION 6

1 Point

The heated junction thermocouples measure percent of level over which one of the following ranges?

- a. Top of the vessel (100%) to bottom of the vessel (0%).
- b. Top of the core (100%) to bottom of the core (0%).
- c. Top of the vessel (100%) to top of the core (0%).
- d. Top of the core (100%) to the bottom of the vessel (0%).

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 7

1 Point

The following post-trip conditions exist:

- RCS pressure=500 psia.
- Tc=410°F
- Th=440°F
- CET Average=445°F

Which one of the following actions is required concerning the RCPs?

- a. No action is required.
- b. Trip only one RCP.
- c. Trip one RCP in each loop.
- d. Trip all RCPs.

QUESTION 8

1 Point

The following conditions exist:

- The reactor has tripped as a result of a loss of offsite power.
- D1 and D2 have energized 1A3 and 1A4.
- Auxiliary Feed Pumps will not start.
- Steam Generator levels are currently 20% WR and slowly lowering.
- All other safety functions are met.

Which one of the following procedures should be implemented immediately after EOP-00?

- a. EOP-02.
- b. EOP-06.
- c. EOP-20/HR-2
- d. EOP-20/HR-4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 9

1 Point

During an entry into a Confined Space within the RCA, the Confined Space Entry Permit is maintained at which one of the following places?

- a. Confined Space Access Point.
- b. RCA Access Control Point.
- c. Shift Supervisor's Office.
- d. Industrial Safety Coordinator's Office.

QUESTION 10

1 Point

Following a CIAS, how can sampling of the containment sump be accomplished?

- a. Containment sump sample lines do not isolate on a CIAS.
- b. A manual bypass valve is provided to allow sampling of the containment sump following a CIAS.
- c. The isolation signal for the valves can be temporarily bypassed and the valves opened following a CIAS.
- d. No containment sump sample can be taken until the CIAS is reset.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 11

1 Point

Prior to placing a Gas Decay Tank in service, which one of the following conditions must be verified?

- a. Iodine-131 dose equivalent less than $1\mu\text{Ci/gm}$.
- b. Total activity less than $1\mu\text{Ci/gm}$.
- c. Oxygen concentration less than 3%.
- d. Nitrogen concentration greater than 20%.

QUESTION 12

1 Point

The plant is operating at full power when high radiation in the Auxiliary Building results in a VIAS. Which one of the following describes the response of the Spent Fuel Area Charcoal Filters (VA-66) to this event?

- a. They will not be affected.
- b. Their bypass damper (HCV-712A) will close and their isolation damper (HCV-712B) will open.
- c. Their bypass damper (HCV-712A) will close. Their isolation damper (HCV-712B) will not be affected.
- d. Their bypass damper (HCV-712A) will not be affected. Their isolation damper (HCV-712B) will open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 13

1 Point

Which one of the following is an indication of RCS void formation during a natural circulation cooldown?

- a. Pressurizer level lowers while operating auxiliary pressurizer spray.
- b. The RCS can not be depressurized to SDC entry conditions.
- c. RCS subcooling is 25°F.
- d. A rapid increase in indicated Reactor Vessel Level on QSPDS.

QUESTION 14

1 Point

The following sequence of events occurs:

- An SIAS starts all ECCS pumps.
- The diesels are running normally.
- Offsite power is lost.
- None of the RCP breakers open on Load Shed.

Which one of the following describes the effect that these events will have on the restart of the ECCS pumps as a result of load sequencer operation?

- a. All ECCS pumps will restart normally.
- b. Only the HPSI pumps will restart.
- c. All except the HPSI pumps will restart.
- d. No ECCS pumps will restart.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 15

1 Point

The following plant conditions exist:

- The reactor is in Mode 4.
- The pressurizer manway is in place.
- Shutdown Cooling is in service.
- Shutdown Cooling Isolation Valves (HC-347/348) then go fully closed.

Which one of the following is the most likely cause of these events?

- a. Pressurizer pressure channel P-115 has failed low.
- b. Pressurizer pressure channel P-118 has failed low.
- c. Power has been lost to pressurizer pressure channel P-115.
- d. Power has been lost to pressurizer pressure channel P-118.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 16

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- The Tave signal from Channel A RRS to the Pressurizer level control system fails upscale.
- The operator immediately takes the A/B switch on panel CB-4 to B.
- The Pressurizer level channel selector switch is selected to X.

Which one of the following is the expected consequence of these events?

- a. Actual and indicated pressurizer level will be unaffected.
- b. Indicated pressurizer level will decrease, actual level will be unaffected.
- c. Actual pressurizer level will decrease.
- d. Actual pressurizer level will increase.

QUESTION 17

1 Point

Under which one of the following conditions will the Subcooled Margin Monitors on CB-4 provide invalid results?

- a. With Containment Pressure greater than 5 psig.
- b. With Pressurizer Pressure below 1700 psia.
- c. With RCS Coolant Temperatures below 465°F
- d. With Containment Temperature above 180°F.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 18

1 Point

The following conditions exist:

- River temperature is 55°F.
- The plant is operating at full power.
- Raw Water Pump AC-10A has been inop for the past 3 days.
- Containment Spray Pump SI-3B has just been declared inop.

In order to satisfy the requirements of Tech Specs, these conditions require that the plant be taken to HOT SHUTDOWN within which one of the following times?

- a. The plant should already be in HOT SHUTDOWN.
- b. 36 hours.
- c. 4½ Days.
- d. 7½ days.

QUESTION 19

1 Point

The following conditions exist:

- The plant is in Cold Shutdown for a refueling outage.
- The containment purge system is operating in the low purge rate mode with fan VA-77.
- A high alarm occurs on radiation monitor RM-062 [stack gas monitor].

Which one of the following describes the expected response of the containment purge system to these events?

- a. The inboard containment isolation valves only would close and the low purge rate fan would trip.
- b. The outboard containment isolation valves only would close and the low purge rate fan would trip
- c. Both the inboard and the outboard isolation valves would close and the low purge fan would trip.
- d. No automatic action would occur.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 20

1 Point

The MSIVs are open when power is lost on DC bus #2. Which one of the following describes the effect that this event will have on the MSIVs?

- a. An SGLS A will be generated and both MSIVs will close.
- b. An SGLS B will be generated and both MSIVs will close.
- c. An SGLS B will be generated and MSIV 1042A will close.
- d. An SGLS B will be generated but neither MSIV will close.

QUESTION 21

1 Point

The following conditions exist:

- The plant is at 100% power.
- All major breakers are in their normal lineup.
- The electrical distribution system is aligned for automatic operation.
- The control switch for breaker 1A11 is then turned to the open (green flag) position.

Which one of the following will occur as a result of these conditions?

- a. Breaker 1A11 will not open unless breaker 1A31 is closed first.
- b. A fast transfer will occur with breaker 1A31 closing before breaker 1A11 opens.
- c. A fast transfer will occur with breaker 1A11 opening before breaker 1A31 closes.
- d. Breaker 1A11 will open but breaker 1A31 will not close.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 22

1 Point

Diesel generator D1 has received a start signal as a result of a reactor trip. The engine lube oil pump discharge pressure switch has failed in the low pressure position. Which one of the following describes the expected response of D1 to these events?

- a. It will not start.
- b. It will start but will trip after 15 seconds.
- c. It will start and then idle at 500 rpm.
- d. It will start and then run at 900 rpm.

QUESTION 23

1 Point

With the plant operating at full power, which one of the following diesel generator operability histories is in compliance with the requirements of Tech Spec 2.7 2(j)?

- a. DG-1 is inop from 4/26 to 5/4
- b. DG-2 is inop from 4/24 to 4/30 and from 5/2 to 5/5
- c. DG-1 is inop from 4/20 to 4/25 and DG-2 is inop from 4/26 to 4/30.
- d. DG-1 is inop from 4/25 to 4/30 and DG-2 is inop from 4/28 to 5/2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 24

1 Point

Which one of the following conditions will cause the Control Room Ventilation System to automatically switch to the Filtered Air makeup mode of operation?

- a. High inlet Chlorine.
- b. Smoke detected in control room exhaust.
- c. High Iodine activity detected by RM-065.
- d. Containment Radiation High Signal (CRHS) actuation

QUESTION 25

1 Point

The following conditions exist:

- RCS temperature is being maintained on Shutdown Cooling.
- All controls are in auto.
- The operator takes action to decrease RCS temperature.

Which one of the following describes the response of Shutdown Cooling Valves HCV-341 and FCV-326 to this action?

- a. HCV-341 throttles open, FCV-326 throttles closed.
- b. HCV-341 throttles closed, FCV-326 throttles open.
- c. Both valves throttle closed.
- d. Both valves throttle open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 26

1 Point

With the reactor at power, which one of the following is the most reliable indication that a Pressurizer PORV is leaking?

- a. PORV position indicator.
- b. Tail pipe temperature.
- c. Quench tank pressure.
- d. Quench tank temperature.

QUESTION 27

1 Point

At which one of the following containment hydrogen concentrations is initiation of Hydrogen Purge required?

- a. 3%
- b. 5%
- c. 7%
- d. 9%

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 28

1 Point

If the turbine has failed to trip following a reactor trip, which one of the following explains why the contingency action of tripping the EHC pumps is preferred over closing the MSIVs and MSIV bypass valves?

- a. To prevent a possible Turbine overspeed.
- b. To retain the use of MS-291 and MS-292.
- c. To retain the use of the atmospheric and condenser steam dump valves.
- d. To minimize RCS cooldown.

QUESTION 29

1 Point

The following conditions exist:

- Raw Water pumps AC-10A & 10B are running.
- Raw Water pumps AC-10C & 10D are in standby.
- Pump AC-10A trips on an overload fault.

Which one of the following lists the Raw Water pumps expected to be running after this event?

- a. 10C & 10D
- b. 10B & 10D
- c. 10D only
- d. 10B only

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 30

1 Point

Section IV of AOP-23, (Reset of Containment Isolation Actuation Signal (CIAS) and Reset of Ventilation Isolation Actuation Signal (VIAS)), step 4; directs the operator to ensure the Hand Controller thumbwheels for any open HCV-400'C' series CCW valve are set fully counter-clockwise. Which one of the following describes why this direction is necessary?

- a. Ensures adequate CCW flow to the Containment Cooling coils when CIAS is actuated.
- b. Ensures that CCW relief valves do not lift during resetting of CIAS lockouts.
- c. Ensures adequate CCW flow to the Containment Cooling coils when VIAS is actuated.
- d. Ensures that CCW relief valves do not lift during resetting of VIAS lockouts.

QUESTION 31

1 Point

A reactor trip has occurred but one CEA failed to insert because its clutch failed to disengage. Which one of the following will prevent the affected CEA from driving to its LEL in response to a Rod Rundown (RRD)?

- a. Loss of power to the 400 Hz inverter.
- b. Drive Mode Selector Switch in either of the auto positions (AS, AG).
- c. Drive Mode Selector Switch in any of the manual positions (MS, MG, MI).
- d. Drive Mode Selector Switch in the OFF position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 32

1 Point

The following plant conditions exist:

- The plant is at 75% power.
- All CEAs are out.
- Boron Concentration is 650 ppm
- Core age is 10,000 MWD/T

Reactor power is to be increased to 100%. Neglecting the effects of xenon, which one of the following is closest to the boron concentration at 100% power?

- a. 550 ppm
- b. 610 ppm
- c. 630 ppm
- d. 690 ppm

QUESTION 33

1 Point

Which one of the following describes the expected response of the CCW Heat Exchanger Bypass Valve (HCV-497) to an SIAS?

- a. Goes fully open.
- b. Goes fully closed.
- c. Closes to minimum flow (15% open).
- d. Does not change position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 34

1 Point

The plant is operating at full power when Pressurizer Pressure Sigma Meter (A/P-102) fails high. Which one of the following is the expected consequence of this event?

- a. PPLS logic becomes 2/3, otherwise no actions occur.
- b. PPLS will automatically block.
- c. Backup heaters energize, pressure increases, spray valves open, and pressure stabilizes at a higher value.
- d. Backup heaters deenergize, pressure decreases, proportional heaters energize, and pressure stabilizes at a lower value.

QUESTION 35

1 Point

EOP-05 (Uncontrolled Heat Extraction) directs the operators to terminate Containment Spray as soon as containment pressure decreases below 3 psig. Which one of the following is the basis for minimizing the amount of spray following a steam line break?

- a. Minimize depletion of Tri-Sodium Phosphate.
- b. Reduce the possibility of Pressurized Thermal Shock.
- c. Minimize the amount of hydrogen generation.
- d. Allow the start of the containment cooling system.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 36

1 Point

The following conditions exist:

- A steam leak has occurred in Room 19.
- The leak was isolated after 30 minutes.
- The leak was upstream of the AFW steam supply check valve.
- The leak was isolated by closing YCV-1045B and its warmup valves.

The operability of which one of the following components is LEAST likely to be affected by these events?

- a. FW-6.
- b. FW-10.
- c. The control room start air compressor.
- d. The standby air compressor.

QUESTION 37

1 Point

A site blackout has occurred and DC loads have been minimized in accordance with EOP-07. Which one of the following specifies the amount of time that the control room instrumentation may be relied upon under these conditions?

- a. 1 hour
- b. 4 hours
- c. 8 hours
- d. 12 hours

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 38

1 Point

With a normal electrical system lineup, which one of the following describes how Instrument Bus 'C' would be powered following failure of its Inverter?

- a. Power would be lost until manually restored.
- b. The supply would automatically switch to the bypass transformer for inverter C.
- c. The Cross Tie breakers between instrument buses A and C would automatically close to supply instrument bus C.
- d. The Cross Tie breakers between instrument buses 1 and C would automatically close to supply instrument bus C.

QUESTION 39

1 Point

Which one of the following describes the expected response of the Fire Protection System to a fire in the East Switchgear Room?

- a. The first detector actuated causes the ventilation dampers to the affected space to shut. After a 60 second time delay, the halon bank discharge is initiated.
- b. After two detectors have actuated in the same space, the ventilation dampers for both switchgear rooms shut and the halon bank discharge is initiated.
- c. The first detector actuated causes the ventilation dampers in both switchgear rooms to shut. The second detector actuated causes the halon bank to discharge.
- d. After two detectors have actuated in the same space, the ventilation dampers in both switchgear rooms shut. After a 60 second time delay, the halon bank discharge is initiated.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 40

1 Point

The following conditions exist:

- The control room has been evacuated.
- A plant cooldown must be conducted from the Alternate Shutdown Panel.

Which one of the following describes the actions necessary to avoid PPLS during this cooldown?

- a. PPLS must be blocked as part of the process of evacuating the control room.
- b. PPLS will not auto initiate with control at the Alternate Shutdown Panel.
- c. All affected equipment must be placed in Pull-to-Lock locally at their breaker panels.
- d. The control power fuses of all affected equipment are removed from their breakers cabinets.

QUESTION 41

1 Point

With the plant at power and no evolutions in progress, which one of the following conditions requires entry into AOP-12 (Loss of Containment Integrity)?

- a. HCV-746A (Pressure Relief) is opened.
- b. One of the Personnel Air Lock doors is open.
- c. An unexpected decrease in containment pressure has occurred.
- d. A containment isolation MOV is inoperable but is locked closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 42

1 Point

EOP-06 (Loss of All Feedwater) directs the operators to trip all RCPs. Which one of the following describes the basis for this action?

- a. Flow from the RCPs would interfere with bleed and feed cooling.
- b. Eliminate the RCPs as a source of heat input to the RCS.
- c. Reduce the risk of clad damage due to quenching if a void forms in the vessel.
- d. Allow the stratification of phases so that liquid water remains in the low point (i.e. reactor vessel).

QUESTION 43

1 Point

If E-Bar is 3.301, which one of the following is the highest RCS activity allowed by technical specifications)?

- a. 30.2 $\mu\text{Ci/gm}$.
- b. 38.1 $\mu\text{Ci/gm}$.
- c. 42.1 $\mu\text{Ci/gm}$.
- d. 48.2 $\mu\text{Ci/gm}$.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 44

1 Point

The following conditions exist:

- No operator actions have been taken.
- Core life is near EOL.
- Power level is 80% and increasing.
- Pressurizer level is following its program level.
- T_{ave} is increasing.
- Containment pressure and temperature are normal.
- Pressurizer pressure is normal.
- All systems are in their normal mode.

Which one of the following is the most likely cause of these conditions?

- a. Partial loss of feedwater heating.
- b. Continuous rod withdrawal.
- c. Steam leak outside containment.
- d. Closure of 1 MSIV.

QUESTION 45

1 Point

Which one of the following is the expected response of nuclear power to a dropped CEA?

- a. The effect on power will be negligible but axial peaking factors will increase.
- b. Power will drop approximately 5% (depending on the worth of the CEA) and remain there. Peaking factors will be unaffected.
- c. Power will drop and then return to near the predrop level. Radial peaking factors will increase.
- d. Power will drop and then return to near the predrop level. The Dropped Rod light on the drawer will be extinguished.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 46

1 Point

Which one of the following describes why it is important for the turbine to trip on a reactor trip?

- a. To preserve steam generator inventory.
- b. To prevent excessive cooldown of the RCS.
- c. To prevent turbine damage due to a loss of load overspeed.
- d. To prevent generator damage due to reverse current.

QUESTION 47

1 Point

The following conditions exist:

- The plant is operating at 100% power.
- Quench tank pressure is being maintained at 7 psig.
- The source of the Quench Tank pressure is that Pressurizer Safety Valve (RC-142) is leaking.

Which one of the following is the temperature expected to be seen on Tailpipe Temperature monitor TIA-136?

- a. 150°F
- b. 230°F
- c. 300°F
- d. 640°F

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 48

1 Point

Which one of the following parameters is the most effective in discriminating between a Small Break LOCA and a Steam Line Break Inside Containment?

- a. Containment Pressure
- b. RCS Pressure
- c. Containment Temperature
- d. Steam Generator Pressure

QUESTION 49

1 Point

The following conditions exist:

- A Large Break LOCA has occurred.
- All safeguards components are operating as required.
- The LO on the primary has announced that he has received LO-LO level alarms on both concentrated boric acid tanks.
- SIAS actuated 26 minutes ago.
- SIRWT level is 52 inches,

Which one of the following actions should be taken at this time?

- a. Place two charging pumps in pull stop, open LCV-218-2, close LCV-218-3, close HCV's-265, 268 and 258.
- b. Place all charging pumps in pull stop, close HCV-238, 239, 240, and 249, open HCV-247, 248 and 308.
- c. Close HCV's-265, 258, and 268, open HCV-308 or HCV-2988
- d. Continue Emergency Boration for an additional 4 minutes or until charging pumps lose suction.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 50

1 Point

In a recent plant modification, valve (HCV-438C) CCW Containment Isolation Valve was physically reversed. Which one of the following describes the reason that this modification was necessary?

- a. Eliminate the need to cooldown and depressurize in order to isolate a leaking RCP seal cooler.
- b. To facilitate the replacement of CRDM seals.
- c. The valve was initially installed incorrectly.
- d. To reduce the possibility of waterhammer in the CCW system on CIAS.

QUESTION 51

1 Point

The following conditions exist:

- The plant on Shutdown Cooling.
- The 'A' Shutdown Cooling Heat Exchanger is not available.
- Shutdown cooling is provided through the 'B' Shutdown Cooling Heat Exchanger.
- The plant has been shutdown for 10 days.
- RCS temperature is 120°F.
- The refueling cavity is flooded.
- Containment integrity is not set.
- Cooling water is lost to the operating shutdown cooling heat exchanger.

Which one of following states the amount of time before which containment integrity must be reset.

- a. 8 hours
- b. 15 hours
- c. 24 hours
- d. 48 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 52

1 Point

The reactor is critical at $10^{-4}\%$ power when an inadvertent Emergency Boration Occurs. RCS boron concentration is raised by 10 ppm before it is stopped. Which one of the following describes the effect that this event will have on T_c ?

- a. It will decrease the most at BOL.
- b. It will decrease the most at EOL.
- c. It will decrease the same at EOL as at BOL.
- d. It will not be significantly affected.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 53

1 Point

The plant is at $1 \times 10^{-1}\%$ with a shutdown in progress. As power decreases which one of the following would provide positive Control Room indication that the Wide Range Nuclear Instrumentation System was in the 'Extended Range'?

- a. Between 10^{-4} and $10^{-5}\%$ power an approximate one decade DECREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- b. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.
- c. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- d. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 54

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- CCW to Detector Well Cooling Containment Isolation valve HCV-467B fails closed.

Which one of the following describes the effect that this will have?

- a. Wide range nuclear instrumentation will swap to extended range.
- b. Primary Rod Position Indication must be declared inoperable.
- c. Variable Overpower Trip (VOPT) pretrip.
- d. The Detector Well Cooling Fans will trip.

QUESTION 55

1 Point

Which one of the following describes the basis for the Technical Specification limits on RCS activity?

- a. To limit Aux building dose rates resulting from a loss of coolant accident.
- b. To limit Aux building dose rates resulting from a fuel handling accident.
- c. To limit offsite doses resulting from a steam generator tube rupture accident.
- d. To limit offsite doses resulting from a loss of feedwater accident.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 56

1 Point

Initiation of LTOP is described in the Floating Step; Blocking of PPLS. Which one of the following states when the LTOP mode of the PORV is enabled?

- a. Whenever the PORV switches are in the AUTO position.
- b. Automatically, whenever pressurizer pressure drops below 1600 psia.
- c. When PPLS is blocked by the Operator.
- d. When RCS temperature is less than 320°F

QUESTION 57

1 Point

The following conditions exist:

- All offsite power has been lost.
- The reactor has tripped.
- EDG #1 did not start and 1A3 is not energized.
- #1 DC bus is deenergized due to a dead short.
- The reason for the EDG failure to start has been corrected.

Which one of the following must be accomplished before the #1 Diesel can be started and loaded?

- a. Start the diesel locally, at AI-133.
- b. Place the diesel back in AUTO.
- c. Transfer DC Control Power to its alternate source.
- d. Start the diesel manually, remotely.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 58

1 Point

The plant is in Mode 1 when the EONA reports that the area monitor in corridor 4 is in alarm and reads 200 mRem/hr. Which one of the following AOPs should be entered as a result of this condition?

- a. None
- b. AOP-08 (Fuel Handling Incident)
- c. AOP-09 (High Radioactivity)
- d. AOP-21 (RCS High Activity)

QUESTION 59

1 Point

The following conditions exist:

- The plant is operating at full power.
- Stack radiation is increasing from the controlled access area of the auxiliary building.
- VCT level is lowering.

Which one of the following compartments is the most likely source of the radioactivity?

- a. Room 21
- b. Corridor 26
- c. The spent fuel storage pool
- d. The letdown heat exchanger room

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 60

1 Point

Which one of the following describes the relationship between plant conditions and indicated vs. actual pressurizer level?

- a. A steam leak in containment will cause indicated level to be higher than actual.
- b. A steam leak in containment will cause indicated level to be lower than actual.
- c. A Steam Generator Tube Rupture will cause indicated level to be higher than actual.
- d. A Steam Generator Tube Rupture will cause indicated level to be lower than actual.

QUESTION 61

1 Point

The following conditions exist:

- Fuel handling operations are in progress.
 - Personnel are working both in Containment and the Aux Building.
 - An Aux Building stack monitor alarms.
 - This initiates VIAS.
 - Area Monitor (RM-087) Spent Fuel Pool Wall alarms. Which one of the following actions should be taken?
- a. Reset and restart containment cooling.
 - b. Verify containment integrity is set.
 - c. Evacuate the Aux Building.
 - d. Trip all Aux Building Exhaust Fans.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 62

1 Point

Following a loss of offsite power pressurizer level is to be maintained above 45%. Which one of the following is the reason that this is necessary?

- a. Assure continued heater operation to preserve subcooling.
- b. Assure adequate pressurizer level for RCP start when power is restored.
- c. Assure adequate RCS inventory during any subsequent cooldown.
- d. Assure adequate inventory for reflux boiling if loss of power is prolonged.

QUESTION 63

1 Point

Which one of the following events would require the immediate termination of any Waste Gas Release in progress?

- a. Containment area monitor alarm.
- b. Stack radiation monitor alarm.
- c. Failure of a containment gas monitor.
- d. Failure of the waste gas flow rate recorder.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 64

1 Point

In the course of conducting a Valve Alignment Verification Checklist, the operator discovers that a particular valve is not in the position called for in the checklist. Which one of the following actions should be taken concerning this valve?

- a. Reposition the valve to the position specified in the checklist.
- b. Place a Caution Tag on the valve.
- c. Inform the Security Shift Supervisor and request an investigation.
- d. Contact the control room for further instructions.

QUESTION 65

1 Point

FW-2B has been tagged out of service for both mechanical and electrical work using a group tagout. The Electrical Group Foreman has requested a temporary clearance to perform some testing on the motor. In addition to the Shift Supervisor, who must approve this temporary clearance?

- a. All persons listed on Attachment 1 to the Group Tagout Sheet.
- b. All persons involved in the testing of the motor.
- c. The maintenance planners involved with both the electrical and the mechanical work.
- d. The Duty Supervisor.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 66

1 Point

The RWP Surveillance and ALARA coordinator has determined that an ALARA job briefing is required for performance of a job in the RCA. Which one of the following restrictions apply until all affected workers attend an ALARA Job Briefing?

- a. TLDs may not be issued to affected workers.
- b. Workers may not sign the RWP.
- c. Workers may not enter the protected area.
- d. The Work Order may not be approved.

QUESTION 67

1 Point

Under which one of the following circumstances may a non-licensed member of the Plant Review Committee (PRC) enter the control room without receiving permission from the Shift Supervisor, LSO, or Licensed Operator?

- a. At any time.
- b. During Shift Turnover.
- c. Under Emergency Conditions.
- d. During a plant outage.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 68

1 Point

Which one of the following jobs require the use of a Ground Fault Circuit Interrupter (GFIC)?

- a. Rescue of an injured worker from a live electrical circuit.
- b. Replacing light bulbs in indoor light fixtures.
- c. Using a portable grinder on a piece of stainless steel near the SIRWT.
- d. Working on a de-energized electrical bus.

QUESTION 69

1 Point

In the event of a total loss of feedwater following a reactor trip on low steam generator level from full power, which one of the following specifies the minimum expected time that steam generator inventory can be relied upon to provide a heat sink?

- a. 10 minutes
- b. 20 minutes
- c. 40 minutes
- d. 60 minutes

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 70

1 Point

In responding to an oil spill and fire within the RCA, which one of the following serves as the Incident Commander?

- a. Any Radiation Protection Tech trained in fire fighting.
- b. The Plant Industrial Safety Coordinator.
- c. The Shift SRO.
- d. A Shift RO.

QUESTION 71

1 Point

Which one of the following CANNOT be used to determine the current revision of a procedure?

- a. Check with Document Control.
- b. Use the On-line CHAMPS index.
- c. Check an official copy at locations listed in SO-G-7.
- d. Check Attachment 1 to SO-G-7.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 72

1 Point

Which one of the following conditions requires that EOP-00 be referenced but NOT entered?

- a. RPS actuation following a manual reactor shutdown with T_c at 520°F.
- b. A reactor trip from 1% power with the generator off-line.
- c. A manual reactor trip from full power.
- d. RPS actuation while on shutdown cooling with T_c at 260°F.

QUESTION 73

1 Point

When using the Gaitronics System, which one of the following channels is reserved for operations department use?

- a. Line 1
- b. Line 2
- c. Line 3
- d. Line 4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 74

1 Point

Following a CIAS, a containment isolation valve which should have closed is stuck in the open position. How will this condition be indicated on the appropriate ERF Computer display page?

- a. The screen symbol for the valve will be green and steady.
- b. The screen symbol for the valve will be green and flashing.
- c. The screen symbol for the valve will be red and steady.
- d. The screen symbol for the valve will be red and flashing.

QUESTION 75

1 Point

An RO initiated a containment vent but did not remember to log it for several hours. Which one of the following is the correct way for this entry to be made?

- a. Insert the entry such that the sequence of events on the page is correct.
- b. Make a normal log entry marking it as a late entry in the time column.
- c. Make a normal log entry and then draw a line to the page location where it should have been entered initially.
- d. No action is required. Containment vents do not need to be logged.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 76

1 Point

With no RCPs running and Tc less than 385°F, Limiting Condition for Operation 2.1.1 prohibits starting an RCP unless:

- Pressurizer steam volume is >53% OR
- ΔT between Tc and S/G is <30°F.

Which one of the following describes the potential consequence of failure to obey this requirement?

- a. Decrease in Shutdown Margin due to introduction of cold water into the core.
- b. Pressurizer outsurge and uncovering of pressurizer heaters.
- c. Overpressure transient caused by thermal expansion from reverse steam generator heat transfer.
- d. RCP damage due to inadequate NPSH.

QUESTION 77

1 Point

In the event of a CIAS, RCP Seal Leakage flow will be directed to which one of the following destinations?

- a. None, seal flow is isolated.
- b. VCT.
- c. RCDT.
- d. Containment Sump.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 78

1 Point

Assuming that the initiating signal is still present, which one of the following letdown isolations can be temporarily overridden by holding the Letdown Isolation Valve (TCV-202) switch in the OPEN position?

- a. High Temperature.
- b. High Flow
- c. CIAS
- d. None - a letdown isolation cannot be overridden in this manner.

QUESTION 79

1 Point

The following plant conditions exist:

- A normal plant cooldown is in progress.
- The PPLS Block switches have been placed in the BLOCK position.
- RCS pressure is 1650 psia.
- Pressurizer heaters are inadvertently energized and pressure rises to 1850 psia.
- The heaters are then deenergized and RCS pressure is rapidly reduced to 1570 psia.

Which one of the following undesired auto actions is most likely to occur as a result of this sequence of events?

- a. No undesired auto actions should occur.
- b. SIAS but not CIAS.
- c. CIAS but not SIAS.
- d. Both SIAS and CIAS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 80

1 Point

What design feature of the RPS prevents placing two TM/LP trip units in bypass at the same time?

- a. When a trip unit is bypassed with the bypass key, contacts open in the logic ladder which prevent bypassing another TM/LP trip unit.
- b. Only one channel can be selected using the bypass key to operate the 5-position TM/LP trip bypass switch.
- c. Only one TM/LP trip unit can be tripped at a time since there is only one TM/LP trip unit bypass key.
- d. No design feature is provided. Bypassing two trip units is prevented by administrative control.

QUESTION 81

1 Point

The plant is operating at 50% power with the Channel A High Power trip unit in bypass. Which one of the following describes the effect of deenergizing another High Power Trip Unit?

- a. The reactor will trip.
- b. The reactor will trip only if the deenergized drawer is Channel C.
- c. No reactor trip will occur but trip logic becomes 2 of 2.
- d. No reactor trip will occur but trip logic becomes 1 of 2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 82

1 Point

The containment cooler inlet and outlet valves (HCV-400A/C, 401A/C, 402A/C, and 403A/C) will automatically close following a CIAS if which one of the following conditions exists?

- a. CCW pump discharge pressure is less than 60 psig.
- b. A containment pressure high signal [CPHS] is not present.
- c. The fan associated with the containment cooling unit fails to start within 50 seconds.
- d. There is low CCW flow from the containment cooler.

QUESTION 83

1 Point

The plant is operating at full power when Steam Generator Level Detector (LT-903) fails high. Which one of the following describes the expected response of the affected steam generator's Feed Reg Valve?

- a. It will shift to manual control and remain as is.
- b. It will shift to manual control and close and remain closed until reopened by the operator.
- c. It will shift to manual control, close and then shift back to auto and re-open to its original position.
- d. It will remain in auto but go closed and remain fully closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 84

1 Point

Prior to starting AFW pump (FW-6) from control board sections CB-10,11, you must first perform which one of the following actions?

- a. Verify HCV-1384 is open.
- b. Verify no EFWST level alarms.
- c. Verify its recirc valve is open.
- d. Verify switch FW/43 is in OFF.

QUESTION 85

1 Point

The following plant conditions exist:

- A steam leak upstream of the MSIV on the A S/G has occurred.
- Pressure in the A S/G is 480 psia.
- Level in the A S/G is 30%(WR).
- Pressure in the B S/G is 575 psia.
- Level in the B S/G is 60%(WR).
- The MSIVs are closed.

Which one of the following is the current status of the AFW system?

- a. AFW should be feeding the A S/G.
- b. AFW should be feeding the B S/G.
- c. AFW should be feeding both S/Gs.
- d. AFW should not have initiated yet.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 86

1 Point

An alarm on RM-054B (Steam Generator Blowdown Monitor for 'B' Steam Generator) will affect S/G blowdown and sample flows in which one of the following ways?

- a. Blowdown and sample flow will be automatically isolated from the 'B' S/G only.
- b. Blowdown flow will be automatically isolated from the 'B' S/G only. Sample flow will be unaffected.
- c. Blowdown and sample flow will be automatically isolated from both S/Gs.
- d. Blowdown flow will be automatically isolated from both S/Gs. Sample flow will be unaffected.

QUESTION 87

1 Point

Which one of the following conditions requires entry into AOP-22 (Reactor Coolant Leak)?

- a. CRDM Seal leakage is 0.8 gpm.
- b. CRDM Seal leakage is 1.2 gpm.
- c. Unidentified leakage is 0.8 gpm.
- d. Unidentified leakage is 1.2 gpm

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 88

1 Point

The 120 VAC power supply to AI-196 has been lost. Which one of the following describes the method or ability to bypass Diverse Scram System Channel A?

- a. Place the TEST/BYPASS switch on AI-196 to the bypass position.
- b. Place the TEST/BYPASS switches on both panels to the bypass position.
- c. It is not possible to bypass a single sensor channel on loss of 120 VAC power.
- d. The DSS channel will automatically bypass on loss of 120 VAC power.

QUESTION 89

1 Point

A reactor startup is in progress when a Group 1 rod drops into the core. Which one of the following actions is required as a result of this event?

- a. The dropped rod must be recovered.
- b. Emergency boration must be initiated.
- c. All regulating group rods must be inserted.
- d. The reactor must be tripped.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 90

1 Point

Which one of the following instrument errors would cause the reactor power calculated by XC-105 to be less than actual reactor power?

- a. Turbine first stage pressure indicating lower than actual.
- b. Feedwater temperature indicating higher than actual.
- c. Feedwater flow indicating higher than actual.
- d. Main generator electrical output indicating less than actual.

QUESTION 91

1 Point

In the Vital Auxiliaries portion of EOP-20; Functional Recovery, operators are instructed to maintain S/G level above 85%. Which one of the following is the reason that this is desirable?

- a. Prevents dryout of AFW nozzles
- b. Reduces thermal stress on the feed ring.
- c. Minimizes the chance of feed ring damage due to waterhammer.
- d. Provides an inventory surplus to support electric feed pump restoration.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 92

1 Point

The plant is operating at steady state full power when level in one steam generator is seen to decrease. Which one of the following is a possible cause of this decrease?

- a. Electrical control power has been lost to the affected S/G's Feed Reg Valve.
- b. Control Air pressure has been lost to the affected S/G's Feed Reg Valve.
- c. Steam pressure has failed low on the affected side.
- d. Steam flow has failed high on the affected side.

QUESTION 93

1 Point

Which one of the following combinations of white lights on AI-41A/B is an indication of a ground on the 125 VDC system?

- a. Both bright.
- b. One bright, one off.
- c. Both off.
- d. Both dim.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 94

1 Point

The plant is operating normally at power when a transformer failure causes the voltage on bus 1A3 to decrease to 3000 VAC. Which one of the following describes the response of the OPLS?

- a. No OPLS will be generated.
- b. OPLS will start Diesel Generator #1.
- c. OPLS will start Diesel Generator #2.
- d. OPLS will start both Diesel Generators.

QUESTION 95

1 Point

Which one of the following is capable of providing a source of fire main water if the fire system pumps are inoperable?

- a. Screen wash pumps.
- b. Seal water pumps.
- c. Raw water pumps.
- d. Circulating water pumps.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 96

1 Point

Fire protection coverage for the containment charcoal filters has recently changed. Which one of the following describes the current fire protection scheme for these filters?

- a. The containment spray system is physically available but is not to be used to combat fires.
- b. The containment spray system has been physically connected to the filters and is now to be used to combat fires.
- c. The containment spray system has been physically disconnected from the filters.
- d. The containment spray connection has been replaced by a dedicated CO₂ system.

QUESTION 97

1 Point

The plant is at 25% power when the Main Turbine trips followed by a Reactor trip. Which one of the following valves, if it failed closed, is a possible cause of this event?

- a. The #1 Turbine Stop Valve.
- b. The #1 Turbine Control Valve.
- c. The #2 Turbine Control Valve.
- d. MSIV HCV-1042A.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 98

1 Point

The plant is operating at 20% power when a PDIL Rod Block occurs. Which one of the following instrument failures could be the cause of this event?

- a. T-cold instrument fails high.
- b. T-hot instrument fails high.
- c. Power Range NI instrument fails low.
- d. Wide Range NI instrument fails low.

QUESTION 99

1 Point

All Raw Water flow has been lost to the CCW heat exchangers. Once the plant is tripped, which one of the following describes the best RCS cooling/pressure control mode allowed under these circumstances?

- a. Forced convection with 4 RCPs since RCP cooling will be unaffected.
- b. Forced convection with 3 RCPs since CCW can usually support the operation of 3 RCPs for a significant period.
- c. Forced convection with 1 RCP per loop since CCW can usually support the operation of 2 RCPs for a significant period.
- d. Once through cooling due to loss of ability to enter shutdown cooling.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 100

1 Point

The following plant conditions exist:

- An Alert has been declared.
- No release of radioactive material has occurred.
- A Plant Evacuation has been declared.

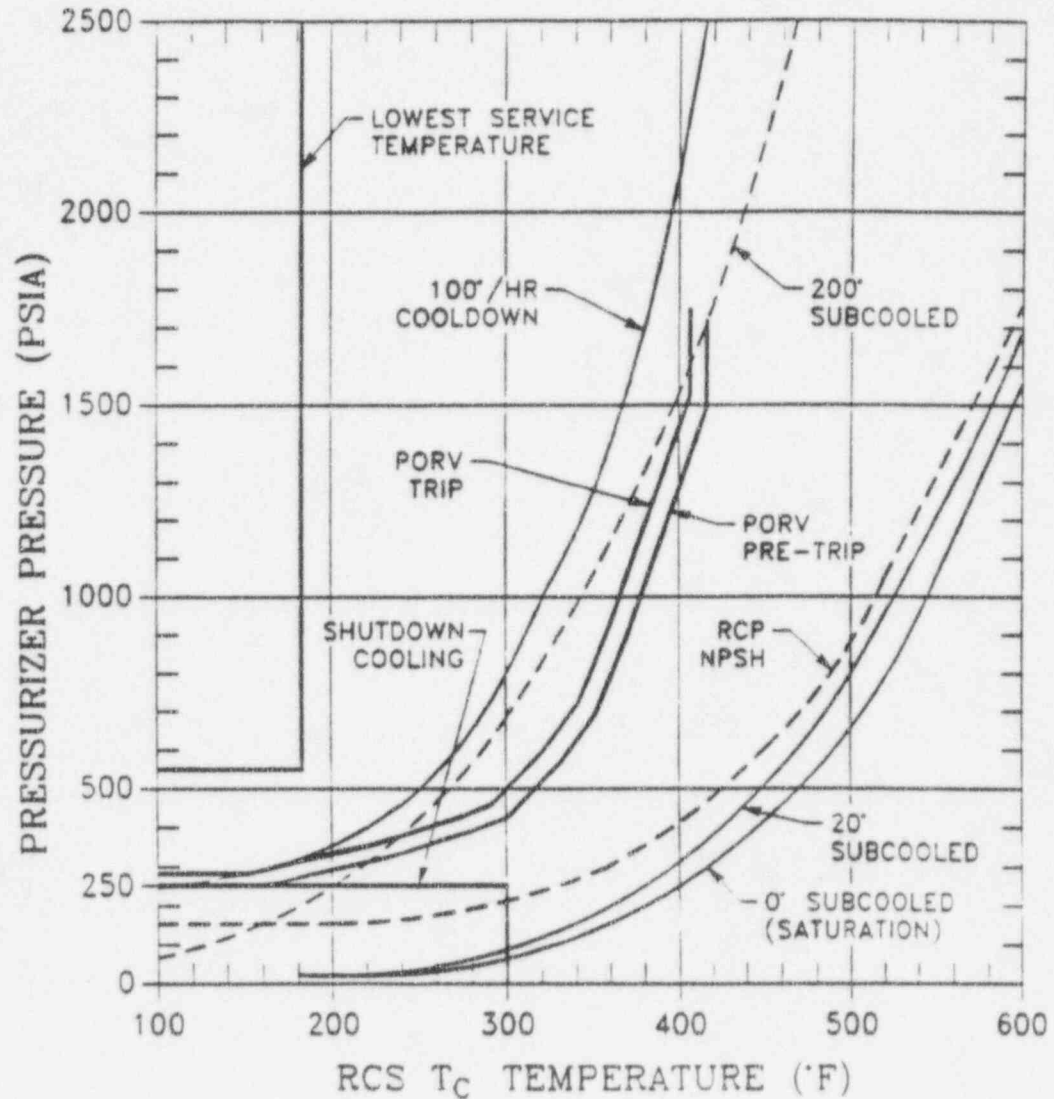
Under these conditions, all non-essential personnel should follow which one of the following evacuation routes?

- a. To the North Omaha Power Station via the Normal Security Access Point.
- b. To the North Omaha Power Station via the North Security Access Point.
- c. To the Admin Building via the Normal Security Access Point.
- d. To the Admin Building via the South Security Access Point.

***** END OF EXAMINATION *****

Attachment 2

RCS Pressure-Temperature Limits



NOTES

1. This curve is only valid through 20 EFPHY.
2. 200°F subcooled curve supersedes 100°/HR cooldown curve anytime RCS has experienced an uncontrolled cooldown causing RCS temperature to go below 500°F.
3. To be the most conservative during forced circulation, T_{in}, or during natural circulation, CETs should be used for the 20°F subcooled and the saturation curve. T_c should be used for all other curves.

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 Containment Cooling

Applicability

Applies to the operating status of the containment cooling systems.

Objective

To assure operability of equipment required to remove heat from the containment during normal operating and emergency situations.

Specifications

(1) Minimum Requirements

- * a. The reactor shall not be made critical, except for low-temperature physics tests, unless all the following are met:
- ** f. The following equipment normally associated with diesel-generator D1 (4.16-kV bus 1A3 and associated non-automatically transferring 480-Volt bus sections) is operable, except as noted: (1)
- | | |
|--|--------|
| Raw water pump | AC-10A |
| Raw water pump | AC-10C |
| Component cooling water pump | AC-3A |
| Component cooling water pump | AC-3C |
| Containment spray pump | SI-3A |
| Containment air cooling and filtering unit | VA-3A |
| Containment air cooling unit | VA-7C |
- ** 1f. The following equipment normally associated with diesel-generator D2 (4.16-kV 1A4 and associated non-automatically transferable 480 Volt bus sections) is operable, except as noted. (1)
- | | |
|--|--------|
| Raw water pump | AC-10B |
| Raw water pump | AC-10D |
| Component cooling water pump | AC-3B |
| Containment spray pump | SI-3B |
| Containment air cooling and filtering unit | VA-3B |
| Containment air cooling unit | VA-7D |
| Containment spray pump | SI-3C |
- ** 11f. All heat exchangers, valves, piping and interlocks associated with the above components and required to function during accident conditions are operable.

(1) Reactor may be made critical with one inoperable raw water pump. LFC action statements shall apply.

* SEE TSI-93-03

** SEE TSI-94-09

*** SEE TSI-95-09

2.0 LIMITING CONDITIONS FOR OPERATION
2.4 Containment Cooling (Continued)

- b. During power operating one of the components listed in (1)a.1. and ii. may be inoperable. If the inoperable component is not restored to operability within seven days, the reactor shall be placed in hot shutdown condition within 12 hours. If the inoperable component is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.
- c. For cases involving Raw Water pump inoperability, if the river water temperature is below 60 degrees Fahrenheit, one Raw Water pump may be inoperable indefinitely without applying any LCO action statement. When the river water temperature is greater than 60 degrees Fahrenheit, an inoperable Raw Water pump shall be restored to operability within 7 days or the reactor shall be placed in a hot shutdown condition within 12 hours. If the inoperable Raw Water pump is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

(2) Modification of Minimum Requirements

During power operation, the minimum requirements may be modified to allow a total of two of the component listed in (1)a.1. and ii. to be inoperable at any one time (this does not include one Raw Water pump which may be inoperable as described above if the river water temperature is below 60 degrees Fahrenheit). Only two raw water pumps may be out of service during power operations. If the operability of one component is not restored within 24 hours, the reactor shall be placed in a hot shutdown condition within 12 hours. LCO 2.4(1)b. shall be applied if one of the inoperable components is restored within 24 hours. If the operability of both components is not restored within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

Any valves, interlocks and piping directly associated with one of the above components and required to function during accident conditions shall be deemed to be part of that component and shall meet the same requirements as for that component.

Any valve, interlock or piping associated with the containment cooling system which is not included in the above paragraph and which is required to function during accident conditions

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 Containment Cooling (Continued)

may be inoperable for a period of no more than 24 hours.
If operability is not restored within 24 hours, the reactor
shall be placed in a hot shutdown condition within 12 hours.

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems

Applicability

Applies to the availability of electrical power for the operation of plant components.

Objective

To define those conditions of electrical power availability necessary to provide for safe reactor operation and the continuing availability of engineered safety features.

Specifications

(1) Minimum Requirements

The reactor shall not be heated up or maintained at temperatures above 300°F unless the following electrical systems are operable:

- a. Unit auxiliary power transformers TIA-1 or -2 (4,160 V).
- b. Heatservice transformers TIA-3 and 4 (4,160 V).
- c. 4,160 V engineered safety feature buses 1A3 and 1A4.
- d. 4,160 V/480 V Transformers TIB-3A, TIB-3B, TIB-3C, TIB-4A, TIB-4B, TIB-4C.
- e. 480 V distribution buses 1B3A, 1B3A-4A, 1B4A, 1B3B, 1B3B-4B, 1B4B, 1B3C, 1B3C-4C, 1B4C.
- f. MCC No. 3A1, 3B1, 3A2, 3C1, 3C2, 4A1, 4A2, 4C1 and 4C2.
- g. 125 V d-c buses No. 1 and 2 (Panels EE-8F and EE-8G).
- h. 125 V d-c distribution panels AI-41A and AI-41B.
- i. 120V a-c instrument buses A, B, C, and D (Panels AI-40-A, B, C and D).
- * j. 120V a-c instrument panels AI-42A and AI-42B.
- k. Station batteries No. 1 and 2 (EE-8A and EE-8B) including one battery charger on each 125V d-c bus No. 1 and 2 (EE-8F and EE-8G).
- l. Two emergency diesel generators (DG-1 and DG-2).
- m. One diesel fuel storage system containing a minimum volume of 16,000 gallons of diesel fuel in FO-1, and an additional 8,000 gallons of diesel fuel in FO-10.

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems (Continued)

(2) Modification of Minimum Requirements

The minimum requirements may be modified to the extent that one of the following conditions will be allowed after the reactor coolant has been heated above 300°F. However, the reactor shall not be made critical unless all minimum requirements are met. If any of the provisions of these exceptions are violated, the reactor shall be placed in a hot shutdown condition within the following 12 hours. If the violation is not corrected within an additional 12 hours, the reactor shall be placed in a cold shutdown condition within an additional 24 hours.

- a. Both unit auxiliary power transformers T1A-1 and -2 (4.16 kV) may be inoperable for up to 24 hours provided the operability of both diesel generators is demonstrated immediately.
- b. Either house service transformer T1A-3 or T1A-4 (4.16kV) may be inoperable for up to 7 days provided the operability of the diesel generator associated with the inoperable transformer is immediately verified. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 7 days is permissible, provided a special report is submitted to the NRC within 48 hours after transformer inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of transformer operability and the additional precautions to be taken while the transformer is out of service.
- c. Both house service transformers T1A-3 and T1A-4 (4.16kV) may be inoperable for up to 72 hours provided the operability of both diesel generators is immediately verified. The loss of the 161kV incoming line renders both transformers inoperable. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 72 hours is permissible, provided a special report is submitted to the NRC within 48 hours after both transformers' inoperability pursuant to Section 5.9. of the Technical Specifications. The special report will outline the plans for restoration of the transformers' operability and the additional precautions to be taken while the transformers are out of service.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

- d. Either one of the 4.16kV engineered safeguards buses, 1A3 or 1A4 may be inoperable for up to 8 hours provided the operability of the diesel generator associated with the operable bus is demonstrated immediately and there are no inoperable required engineered safeguards components associated with the operable bus.
- e. One of each group of 4160 V/480 V Transformers (T1B-3A or 4A), (T1B-3B or 4B), and (T1B-3C or 4C) may be inoperable for up to 8 hours provided there are no inoperable required engineered safeguards components which are redundant to components on the inoperable transformer.
- f. One of the 480 V distribution buses connected to bus 1A3 or connected to bus 1A4 may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus.
- g. Either Group of MCC No.'s (3A1, 3B1, 3A2, 3C1, 3C2,) or (4A1, 4A2, 4C1, 4C2) may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable MCC. MCC 3C1 may be inoperable in excess of 8 hours if battery chargers No. 1 and No. 2 are operable.
- h. One of the four 120V a-c instrument buses (A, B, C or D) may be inoperable for 8 hours provided the reactor protective and engineered safeguards systems instrument channels supplied by the remaining three buses are all operable.
- i. Two battery chargers may be inoperable for up to 8 hours provided battery charger No. 1 (EE-8C) or No. 2 (EE-8D) is operable.
- *
**
*** j. Either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to seven days (total for both) during any month, provided there are no inoperable required engineered safeguards components associated with the operable diesel generator. If one diesel generator is inoperable, within 8 hours (regardless of when the inoperable diesel generator is restored to operability) EITHER:
- (1) Start the other diesel generator to verify operability, OR
 - (2) Ensure the absence of common cause for the diesel generator inoperability for the other diesel generator.
- k. If inventory of diesel fuel in FO-1 is less than 16,000 gallons and/or FO-10 is less than 8,000 gallons, but the combined inventory in FO-1 and FO-10 is greater than a 6 day supply (21,350 gallons), then restore the required inventory within 48 hours.

* See TSI-92-13
** See TSI-94-06
*** See TSI-92-03

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems (Continued)

- l. Island buses 1B3A-4A, 1B3B-4B, and 1B3C-4C may be inoperable for up to 8 hours provided there are no inoperable required safeguardis components which are redudant to components on the inoperable bus(es).
- m. Either one of the 125V d-c buses No. 1 or 2 (Panels EE-8F or EE-8G) may be inoperable for up to 8 hours.
- n. Either one of the 125V d-c distribution panels AI-41A or AI-41B may be inoperable for up to 8 hours.
- o. Either one of the 120V a-c instrument panels AI-42A or AI-42B may be inoperable for up to 8 hours.

APPENDIX B
TECHNICAL SPECIFICATION INTERPRETATION

TSI- 92-13

TECHNICAL SPECIFICATION REFERENCE: 2.7

TECHNICAL SPECIFICATION PAGE NO.: 2-34

PARAGRAPH/TABLE/ITEM: 2.7(2).i.

INTERPRETATION:

Technical Specification states, "either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to 7 days (total for both) during any month,....." "During any month" is interpreted to mean during any calendar month. The 7 day LCD clock restarts with the beginning of a new month. This is not, however, to be construed as allowing any single diesel outage to exceed 7 days by overlapping outage time at the end of one month with the outage time allowed for a new month.

BASES:

Question was posed to NRC Project Manager, Wayne Walker, who conferred on this issue with NRC-NRR. The NRC is in agreement with this interpretation provided that the 7 day overall limit is not exceeded.

**PRC RECOMMENDS
APPROVAL**

OCT 15 1992

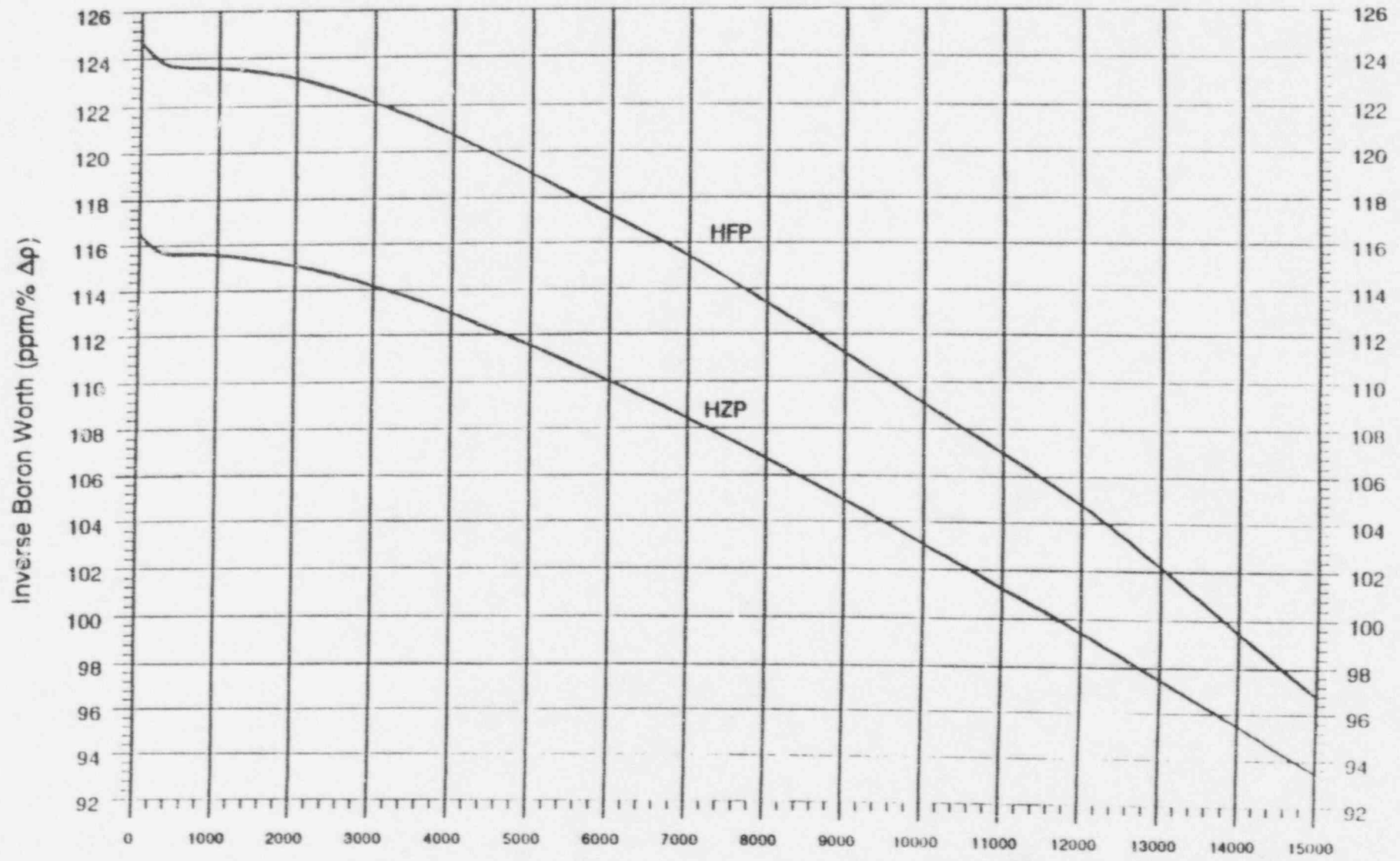
REFERENCES:

PRC MTG. MINUTES

6. CONCURRENCE: *W. Walker* DATE: 10-7-92
Manager - NL&IA

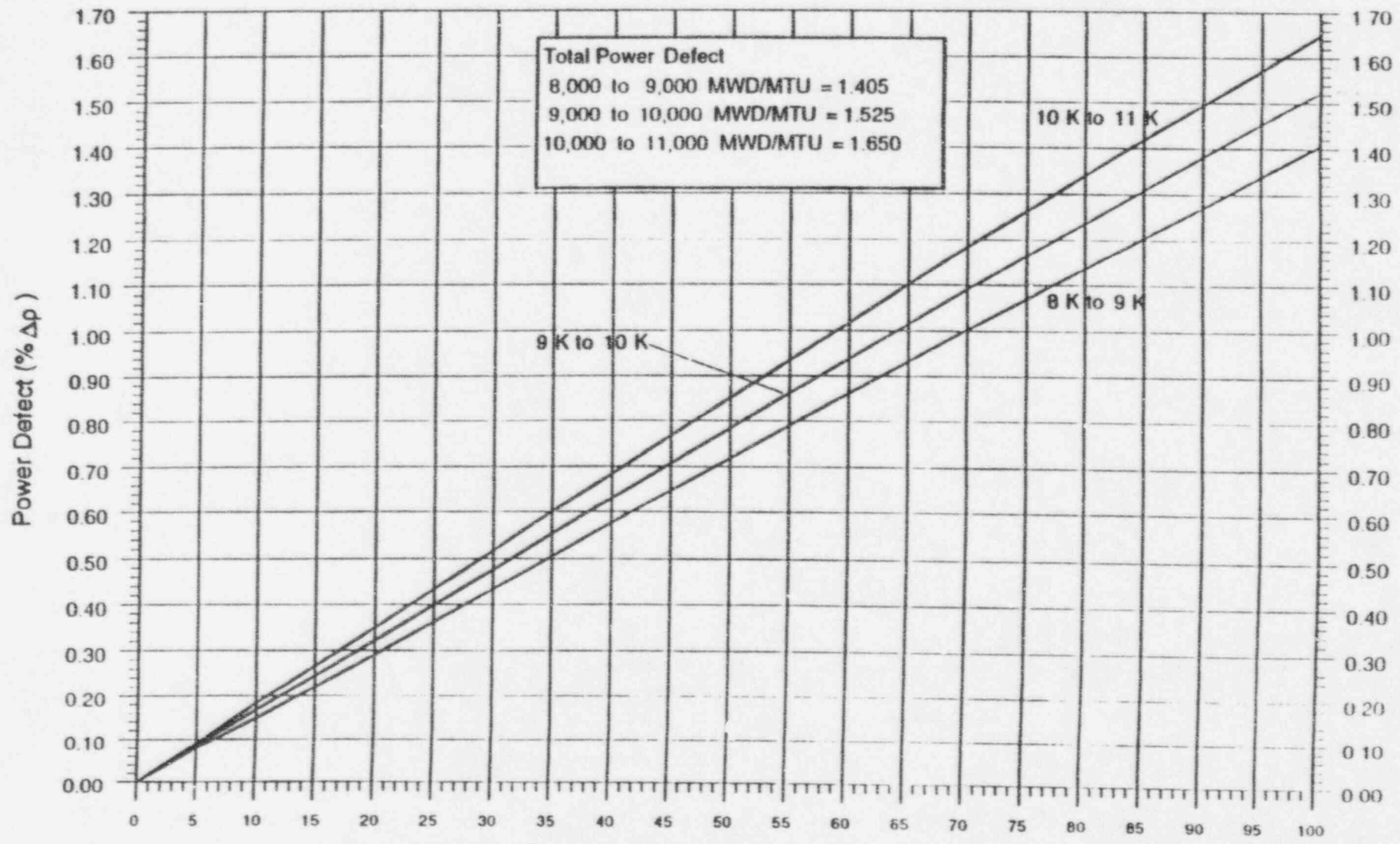
7. APPROVED: *J. Spall* DATE: 10-15-92
Chairman - PRC

Figure II.A.4
Cycle 16 Inverse Boron Worth vs Burnup



R20

Figure II.C.2.b
Cycle 16 Total Power Defect vs Power
(8,000 to 11,000 MWD/MTU)



R20

Attachment B

Time to Boil Determination Worksheet

1. Time Shutdown Cooling was lost: _____
2. Last known RCS/SDCS temperature: _____ °F
from instrument number: _____
3. Record the following information and inform the Shift Supervisor on 10 minute intervals

TIME	CET/HJTC °F	HEATUP RATE	TIME TO BOIL

Alternate Method: $T_b = T_s + T_o - T_c$
Where T_b is the remaining time to boil
 T_s is the approximate time to boil from the appropriate curve
 T_o is the time SDC was lost
 T_c is the current time

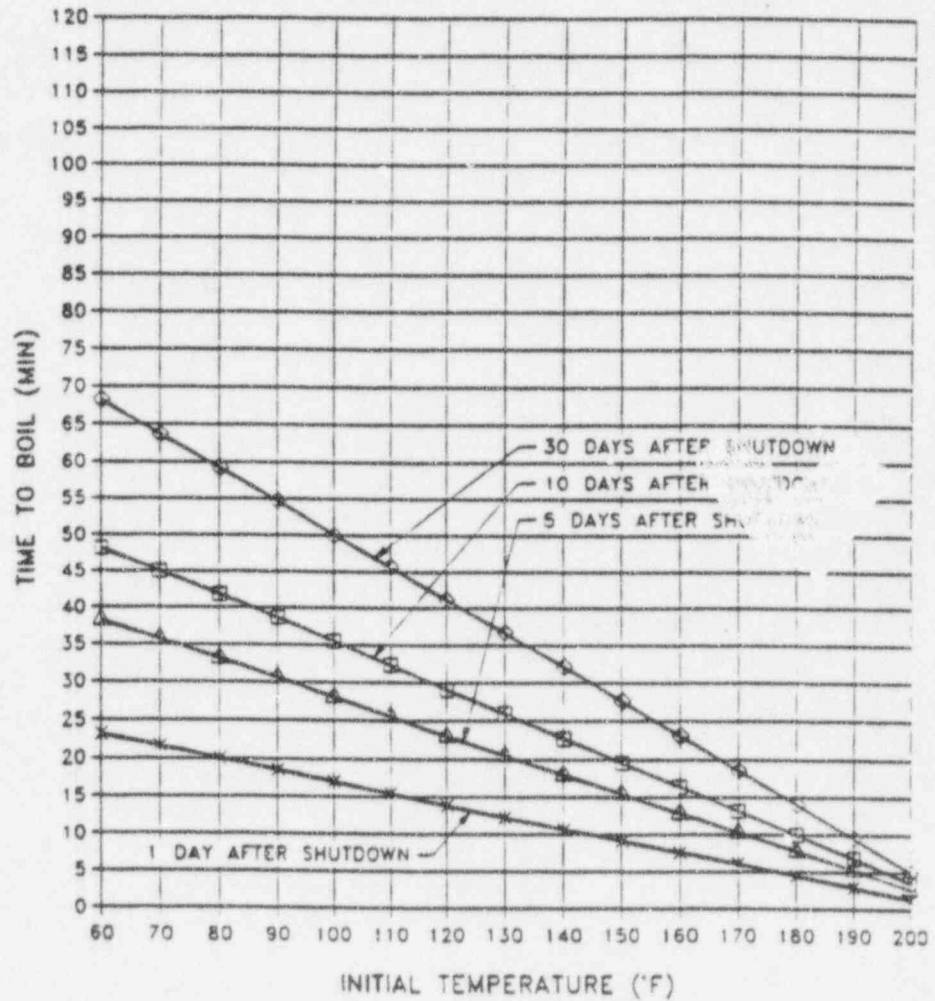
Attachment B

Time to Boil Determination

Time to Boil (RCS at Mid Loop)

APPROXIMATE TIME TO BOIL

RCS AT MID LOOP CONDITIONS



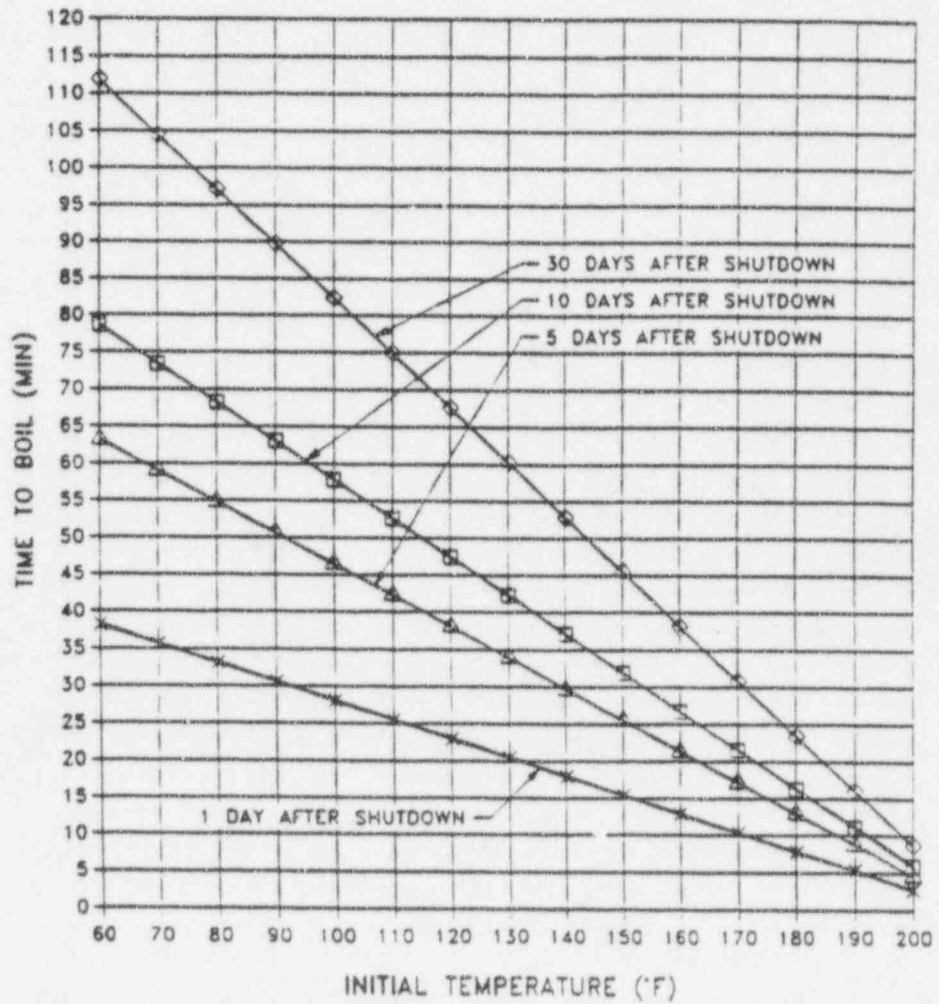
Attachment B

Time to Boil Determination

Time to Boil (RCS at Reactor Vessel Flange)

APPROXIMATE TIME TO BOIL

RCS AT REACTOR VESSEL FLANGE LEVEL CONDITIONS



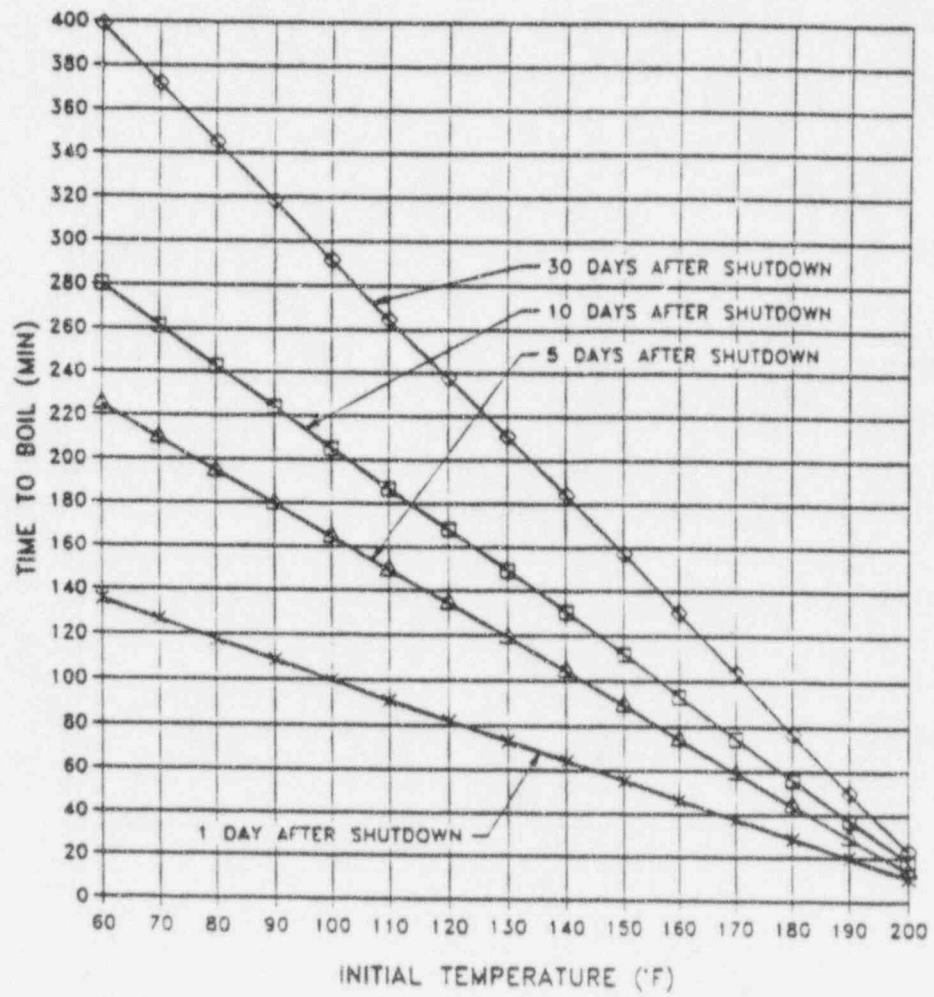
Attachment B

Time to Boil Determination

Time to Boil (RCS at Normal Operating Volume)

APPROXIMATE TIME TO BOIL

RCS AT NORMAL OPERATING LIMITS



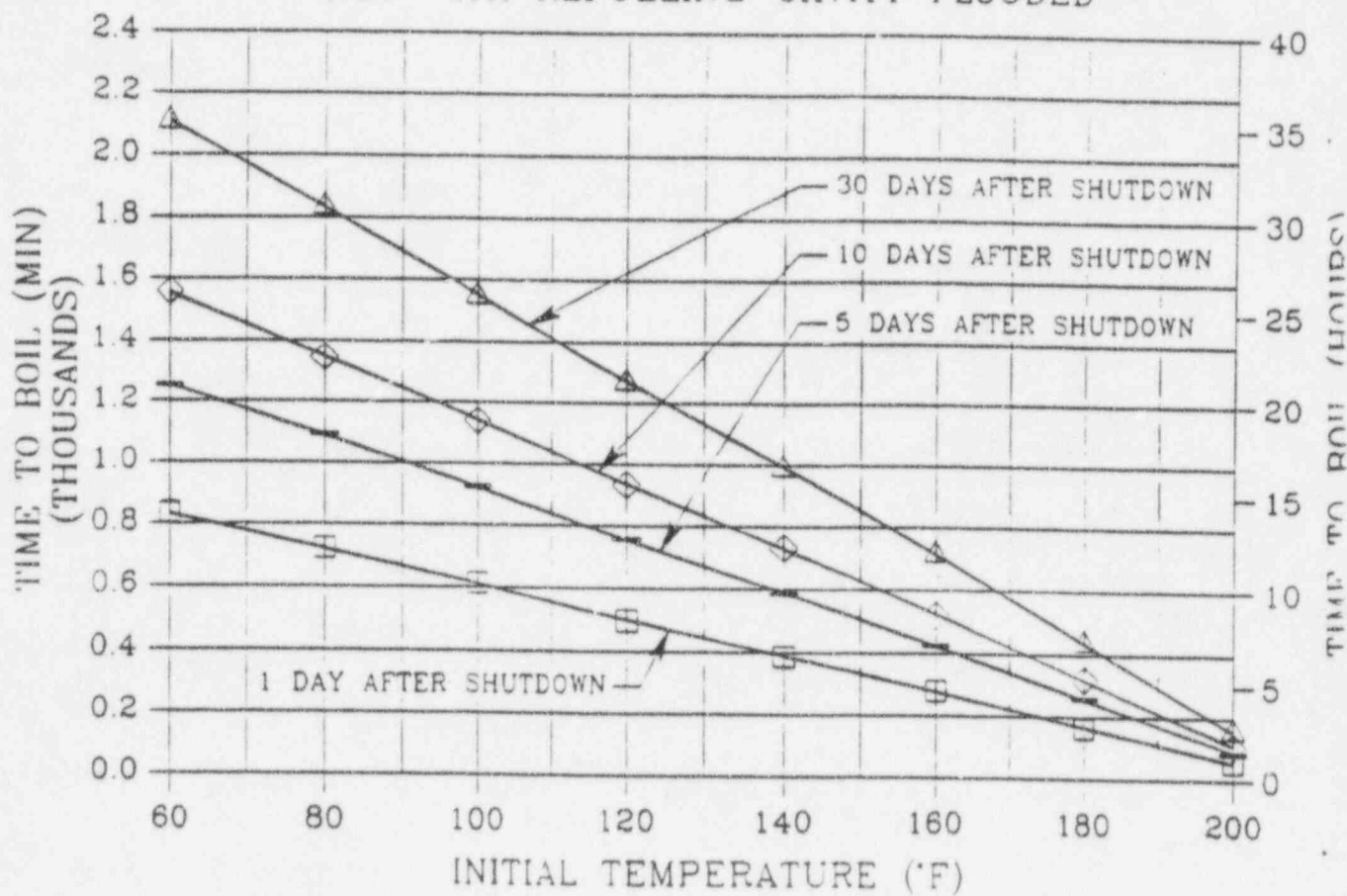
Attachment B

Time to Boil Determination

Time to Boil (Refueling Cavity Flooded)

APPROXIMATE TIME TO BOIL

RCS WITH REFUELING CAVITY FLOODED



End of Attachment B

**U. S. NUCLEAR REGULATORY COMMISSION
SITE-SPECIFIC
WRITTEN EXAMINATION**

APPLICANT INFORMATION

Name: EXAM	Region: I / II / III / (IV) / V
Date: 12/04/95	Facility/Unit: Fort Calhoun
License Level: (RO) / SRO	Reactor Type: W / (CE) / BW / GE

INSTRUCTIONS

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires a final grade of at least 80 percent. Examination papers will be picked up 4 hours after the examination starts.

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

Applicant's Signature

RESULTS

Examination Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

1. Cheating on the examination will result in a denial of your application and could result in more severe penalties.
2. After you complete the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination.
3. To pass the examination, you must achieve a grade of 80 percent or greater.
4. The point value for each question is indicated in parentheses after the question number.
5. There is a time limit of 4 hours for completing the examination.
6. Use only black ink or dark pencil to ensure legible copies.
7. Print your name in the blank provided on the examination cover sheet and the answer sheet.
8. Mark your answers on the answer sheet provided and do not leave any question blank.
9. If the intent of a question is unclear, ask questions of the examiner only.
10. Restroom trips are permitted, but only one applicant at a time will be allowed to leave. Avoid all contact with anyone outside the examination room to eliminate even the appearance or possibility of cheating.
11. When you complete the examination, assemble a package including the examination questions, examination aids, and answer sheets and give it to the examiner or proctor. Remember to sign the statement on the examination cover sheet.
12. After you have turned in your examination, leave the examination area as defined by the examiner.

Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

001 a b c d ----
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REACTOR OPERATOR EXAMINATION

QUESTION 1 1 Point

The following events occur:

- The plant is at full power.
- Rod Drive Clutches are being supplied from Instrument Buses A and C.
- Instrument Bus B is deenergized.
- The operator then inadvertently switches a clutch power supply from Instrument Bus A to Instrument Bus B.

Which one of the following describes the effect that this action will have on CEA position?

- a. No effect.
- b. The shutdown CEAs will drop.
- c. All CEAs will drop.
- d. RPS will generate a reactor trip on one channel.

QUESTION 2 1 Point

During a startup, the connection between the drive mechanism for a high worth Shutdown CEA and its poison fingers becomes uncoupled. As a result, the drive mechanism withdraws normally but all poison fingers associated with it remain fully inserted in the core. Which one of the following describes a symptom that the operators will see as a result of this event?

- a. The affected rod bottom light will remain on.
- b. The SCEAPIS will show no rod motion for that CEA.
- c. Criticality will occur below the PDIL.
- d. The ECP will predict criticality at a higher than actual CEA position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 3

1 Point

The following conditions exist:

- A reactor trip due to a loss of offsite power has occurred.
- An inadvertent SGIS occurred after the trip.
- MS-291 ('A' S/G relief) is open.
- MS-292 ('B' S/G relief) will not open.
- Pressurizer level is 50%.
- Subcooling Margin is 50°F.
- Present RCS Cooldown Rate is 100°F/hr.

Which one of the following describes the expected natural circulation patterns that will develop under these condition?

- a. No natural circulation will develop.
- b. It will develop in the A loop, the B loop will be stagnant.
- c. It will develop in the A loop, reflux boiling will develop in the B loop.
- d. It will develop in the 'A' loop but flow will occur in both loops.

QUESTION 4

1 Point

Which one of the following describes the automatic operation of PCV-1753 (Instrument Air/Service Air Cross Tie)?

- a. It closes if service air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- b. It closes if service air pressure decreases to 80 psig but must be reopened manually.
- c. It closes when instrument air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- d. It closes when instrument air pressure decreases to 80 psig but must be reopened manually.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 5

1 Point

The following conditions exist:

- A LOCA has occurred.
- All HPSI pumps are injecting.
- PPLS has been reset.
- Containment spray is in operation.
- Containment pressure is 6 psig.
- The current source of water is the containment sump.
- RAS has not been reset.

Resetting RAS under these conditions will result in which one of the following consequences?

- a. Potential damage to the lockout relays.
- b. It will be possible to start the LPSI pumps.
- c. The containment spray pumps will trip.
- d. The water source will swap back to the SIRWT.

QUESTION 6

1 Point

The heated junction thermocouples measure percent of level over which one of the following ranges?

- a. Top of the vessel (100%) to bottom of the vessel (0%).
- b. Top of the core (100%) to bottom of the core (0%).
- c. Top of the vessel (100%) to top of the core (0%).
- d. Top of the core (100%) to the bottom of the vessel (0%).

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 7

1 Point

The following post-trip conditions exist:

- RCS pressure=500 psia.
- Tc=410°F
- Th=440°F
- CET Average=445°F

Which one of the following actions is required concerning the RCPs?

- a. No action is required.
- b. Trip only one RCP.
- c. Trip one RCP in each loop.
- d. Trip all RCPs.

QUESTION 8

1 Point

The following conditions exist:

- The reactor has tripped as a result of a loss of offsite power.
- D1 and D2 have energized 1A3 and 1A4.
- Auxiliary Feed Pumps will not start.
- Steam Generator levels are currently 20% WR and slowly lowering.
- All other safety functions are met.

Which one of the following procedures should be implemented immediately after EOP-00?

- a. EOP-02.
- b. EOP-06.
- c. EOP-20/HR-2
- d. EOP-20/HR-4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 9

1 Point

During an entry into a Confined Space within the RCA, the Confined Space Entry Permit is maintained at which one of the following places?

- a. Confined Space Access Point.
- b. RCA Access Control Point.
- c. Shift Supervisor's Office.
- d. Industrial Safety Coordinator's Office.

QUESTION 10

1 Point

Following a CIAS, how can sampling of the containment sump be accomplished?

- a. Containment sump sample lines do not isolate on a CIAS.
- b. A manual bypass valve is provided to allow sampling of the containment sump following a CIAS.
- c. The isolation signal for the valves can be temporarily bypassed and the valves opened following a CIAS.
- d. No containment sump sample can be taken until the CIAS is reset.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 11 1 Point

Prior to placing a Gas Decay Tank in service, which one of the following conditions must be verified?

- a. Iodine-131 dose equivalent less than $1\mu\text{Ci/gm}$.
- b. Total activity less than $1\mu\text{Ci/gm}$.
- c. Oxygen concentration less than 3%.
- d. Nitrogen concentration greater than 20%.

QUESTION 12 1 Point

The plant is operating at full power when high radiation in the Auxiliary Building results in a VIAS. Which one of the following describes the response of the Spent Fuel Area Charcoal Filters (VA-66) to this event?

- a. They will not be affected.
- b. Their bypass damper (HCV-712A) will close and their isolation damper (HCV-712B) will open.
- c. Their bypass damper (HCV-712A) will close. Their isolation damper (HCV-712B) will not be affected.
- d. Their bypass damper (HCV-712A) will not be affected. Their isolation damper (HCV-712B) will open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 13

1 Point

Which one of the following is an indication of RCS void formation during a natural circulation cooldown?

- a. Pressurizer level lowers while operating auxiliary pressurizer spray.
- b. The RCS can not be depressurized to SDC entry conditions.
- c. RCS subcooling is 25°F.
- d. A rapid increase in indicated Reactor Vessel Level on QSPDS.

QUESTION 14

1 Point

The following sequence of events occurs:

- An SIAS starts all ECCS pumps.
- The diesels are running normally.
- Offsite power is lost.
- None of the RCP breakers open on Load Shed.

Which one of the following describes the effect that these events will have on the restart of the ECCS pumps as a result of load sequencer operation?

- a. All ECCS pumps will restart normally.
- b. Only the HPSI pumps will restart.
- c. All except the HPSI pumps will restart.
- d. No ECCS pumps will restart.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 15

1 Point

The following plant conditions exist:

- The reactor is in Mode 4.
- The pressurizer manway is in place.
- Shutdown Cooling is in service.
- Shutdown Cooling Isolation Valves (HC-347/348) then go fully closed.

Which one of the following is the most likely cause of these events?

- a. Pressurizer pressure channel P-115 has failed low.
- b. Pressurizer pressure channel P-118 has failed low.
- c. Power has been lost to pressurizer pressure channel P-115.
- d. Power has been lost to pressurizer pressure channel P-118.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 16

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- The Tave signal from Channel A RRS to the Pressurizer level control system fails upscale.
- The operator immediately takes the A/B switch on panel CB-4 to B.
- The Pressurizer level channel selector switch is selected to X.

Which one of the following is the expected consequence of these events?

- a. Actual and indicated pressurizer level will be unaffected.
- b. Indicated pressurizer level will decrease, actual level will be unaffected.
- c. Actual pressurizer level will decrease.
- d. Actual pressurizer level will increase.

QUESTION 17

1 Point

Under which one of the following conditions will the Subcooled Margin Monitors on CB-4 provide invalid results?

- a. With Containment Pressure greater than 5 psig.
- b. With Pressurizer Pressure below 1700 psia.
- c. With RCS Coolant Temperatures below 465°F
- d. With Containment Temperature above 180°F.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 18

1 Point

The following conditions exist:

- River temperature is 55°F.
- The plant is operating at full power.
- Raw Water Pump AC-10A has been inop for the past 3 days.
- Containment Spray Pump SI-3B has just been declared inop.

In order to satisfy the requirements of Tech Specs, these conditions require that the plant be taken to HOT SHUTDOWN within which one of the following times?

- a. The plant should already be in HOT SHUTDOWN.
- b. 36 hours.
- c. 4½ Days.
- d. 7½ days.

QUESTION 19

1 Point

The following conditions exist:

- The plant is in Cold Shutdown for a refueling outage.
- The containment purge system is operating in the low purge rate mode with fan VA-77.
- A high alarm occurs on radiation monitor RM-062 [stack gas monitor].

Which one of the following describes the expected response of the containment purge system to these events?

- a. The inboard containment isolation valves only would close and the low purge rate fan would trip.
- b. The outboard containment isolation valves only would close and the low purge rate fan would trip
- c. Both the inboard and the outboard isolation valves would close and the low purge fan would trip.
- d. No automatic action would occur.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 20

1 Point

The MSIVs are open when power is lost on DC bus #2. Which one of the following describes the effect that this event will have on the MSIVs?

- a. An SGLS A will be generated and both MSIVs will close.
- b. An SGLS B will be generated and both MSIVs will close.
- c. An SGLS B will be generated and MSIV 1042A will close.
- d. An SGLS B will be generated but neither MSIV will close.

QUESTION 21

1 Point

The following conditions exist:

- The plant is at 100% power.
- All major breakers are in their normal lineup.
- The electrical distribution system is aligned for automatic operation.
- The control switch for breaker 1A11 is then turned to the open (green flag) position.

Which one of the following will occur as a result of these conditions?

- a. Breaker 1A11 will not open unless breaker 1A31 is closed first.
- b. A fast transfer will occur with breaker 1A31 closing before breaker 1A11 opens.
- c. A fast transfer will occur with breaker 1A11 opening before breaker 1A31 closes.
- d. Breaker 1A11 will open but breaker 1A31 will not close.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 22

1 Point

Diesel generator D1 has received a start signal as a result of a reactor trip. The engine lube oil pump discharge pressure switch has failed in the low pressure position. Which one of the following describes the expected response of D1 to these events?

- a. It will not start.
- b. It will start but will trip after 15 seconds.
- c. It will start and then idle at 500 rpm.
- d. It will start and then run at 900 rpm.

QUESTION 23

1 Point

With the plant operating at full power, which one of the following diesel generator operability histories is in compliance with the requirements of Tech Spec 2.7 2(j)?

- a. DG-1 is inop from 4/26 to 5/4
- b. DG-2 is inop from 4/24 to 4/30 and from 5/2 to 5/5
- c. DG-1 is inop from 4/20 to 4/25 and DG-2 is inop from 4/26 to 4/30.
- d. DG-1 is inop from 4/25 to 4/30 and DG-2 is inop from 4/28 to 5/2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 24

1 Point

Which one of the following conditions will cause the Control Room Ventilation System to automatically switch to the Filtered Air makeup mode of operation?

- a. High inlet Chlorine.
- b. Smoke detected in control room exhaust.
- c. High Iodine activity detected by RM-065.
- d. Containment Radiation High Signal (CRHS) actuation

QUESTION 25

1 Point

The following conditions exist:

- RCS temperature is being maintained on Shutdown Cooling.
- All controls are in auto.
- The operator takes action to decrease RCS temperature.

Which one of the following describes the response of Shutdown Cooling Valves HCV-341 and FCV-326 to this action?

- a. HCV-341 throttles open, FCV-326 throttles closed.
- b. HCV-341 throttles closed, FCV-326 throttles open.
- c. Both valves throttle closed.
- d. Both valves throttle open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 26

1 Point

With the reactor at power, which one of the following is the most reliable indication that a Pressurizer PORV is leaking?

- a. PORV position indicator.
- b. Tail pipe temperature.
- c. Quench tank pressure.
- d. Quench tank temperature.

QUESTION 27

1 Point

At which one of the following containment hydrogen concentrations is initiation of Hydrogen Purge required?

- a. 3%
- b. 5%
- c. 7%
- d. 9%

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 28

1 Point

If the turbine has failed to trip following a reactor trip, which one of the following explains why the contingency action of tripping the EHC pumps is preferred over closing the MSIVs and MSIV bypass valves?

- a. To prevent a possible Turbine overspeed.
- b. To retain the use of MS-291 and MS-292.
- c. To retain the use of the atmospheric and condenser steam dump valves.
- d. To minimize RCS cooldown.

QUESTION 29

1 Point

The following conditions exist:

- Raw Water pumps AC-10A & 10B are running.
- Raw Water pumps AC-10C & 10D are in standby.
- Pump AC-10A trips on an overload fault.

Which one of the following lists the Raw Water pumps expected to be running after this event?

- a. 10C & 10D
- b. 10B & 10D
- c. 10D only
- d. 10B only

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 30

1 Point

Section IV of AOP-23, (Reset of Containment Isolation Actuation Signal (CIAS) and Reset of Ventilation Isolation Actuation Signal (VIAS)), step 4; directs the operator to ensure the Hand Controller thumbwheels for any open HCV-400'C' series CCW valve are set fully counter-clockwise. Which one of the following describes why this direction is necessary?

- a. Ensures adequate CCW flow to the Containment Cooling coils when CIAS is actuated.
- b. Ensures that CCW relief valves do not lift during resetting of CIAS lockouts.
- c. Ensures adequate CCW flow to the Containment Cooling coils when VIAS is actuated.
- d. Ensures that CCW relief valves do not lift during resetting of VIAS lockouts.

QUESTION 31

1 Point

A reactor trip has occurred but one CEA failed to insert because its clutch failed to disengage. Which one of the following will prevent the affected CEA from driving to its LEL in response to a Rod Rndown (RRD)?

- a. Loss of power to the 400 Hz inverter.
- b. Drive Mode Selector Switch in either of the auto positions (AS, AG).
- c. Drive Mode Selector Switch in any of the manual positions (MS, MG, MI).
- d. Drive Mode Selector Switch in the OFF position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 32

1 Point

The following plant conditions exist:

- The plant is at 75% power.
- All CEAs are out.
- Boron Concentration is 650 ppm
- Core age is 10,000 MWD/T

Reactor power is to be increased to 100%. Neglecting the effects of xenon, which one of the following is closest to the boron concentration at 100% power?

- a. 550 ppm
- b. 610 ppm
- c. 630 ppm
- d. 690 ppm

QUESTION 33

1 Point

Which one of the following describes the expected response of the CCW Heat Exchanger Bypass Valve (HCV-497) to an SIAS?

- a. Goes fully open.
- b. Goes fully closed.
- c. Closes to minimum flow (15% open).
- d. Does not change position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 34

1 Point

The plant is operating at full power when Pressurizer Pressure Sigma Meter (A/P-102) fails high. Which one of the following is the expected consequence of this event?

- a. PPLS logic becomes 2/3, otherwise no actions occur.
- b. PPLS will automatically block.
- c. Backup heaters energize, pressure increases, spray valves open, and pressure stabilizes at a higher value.
- d. Backup heaters deenergize, pressure decreases, proportional heaters energize, and pressure stabilizes at a lower value.

QUESTION 35

1 Point

EOP-05 (Uncontrolled Heat Extraction) directs the operators to terminate Containment Spray as soon as containment pressure decreases below 3 psig. Which one of the following is the basis for minimizing the amount of spray following a steam line break?

- a. Minimize depletion of Tri-Sodium Phosphate.
- b. Reduce the possibility of Pressurized Thermal Shock.
- c. Minimize the amount of hydrogen generation.
- d. Allow the start of the containment cooling system.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 36

1 Point

The following conditions exist:

- A steam leak has occurred in Room 19.
- The leak was isolated after 30 minutes.
- The leak was upstream of the AFW steam supply check valve.
- The leak was isolated by closing YCV-1045B and its warmup valves.

The operability of which one of the following components is LEAST likely to be affected by these events?

- a. FW-6.
- b. FW-10.
- c. The control room start air compressor.
- d. The standby air compressor.

QUESTION 37

1 Point

A site blackout has occurred and DC loads have been minimized in accordance with EOP-07. Which one of the following specifies the amount of time that the control room instrumentation may be relied upon under these conditions?

- a. 1 hour
- b. 4 hours
- c. 8 hours
- d. 12 hours

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 38

1 Point

With a normal electrical system lineup, which one of the following describes how Instrument Bus 'C' would be powered following failure of its Inverter?

- a. Power would be lost until manually restored.
- b. The supply would automatically switch to the bypass transformer for inverter C.
- c. The Cross Tie breakers between instrument buses A and C would automatically close to supply instrument bus C.
- d. The Cross Tie breakers between instrument buses 1 and C would automatically close to supply instrument bus C.

QUESTION 39

1 Point

Which one of the following describes the expected response of the Fire Protection System to a fire in the East Switchgear Room?

- a. The first detector actuated causes the ventilation dampers to the affected space to shut. After a 60 second time delay, the halon bank discharge is initiated.
- b. After two detectors have actuated in the same space, the ventilation dampers for both switchgear rooms shut and the halon bank discharge is initiated.
- c. The first detector actuated causes the ventilation dampers in both switchgear rooms to shut. The second detector actuated causes the halon bank to discharge.
- d. After two detectors have actuated in the same space, the ventilation dampers in both switchgear rooms shut. After a 60 second time delay, the halon bank discharge is initiated.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 40

1 Point

The following conditions exist:

- The control room has been evacuated.
- A plant cooldown must be conducted from the Alternate Shutdown Panel.

Which one of the following describes the actions necessary to avoid PPLS during this cooldown?

- a. PPLS must be blocked as part of the process of evacuating the control room.
- b. PPLS will not auto initiate with control at the Alternate Shutdown Panel.
- c. All affected equipment must be placed in Pull-to-Lock locally at their breaker panels.
- d. The control power fuses of all affected equipment are removed from their breakers cabinets.

QUESTION 41

1 Point

With the plant at power and no evolutions in progress, which one of the following conditions requires entry into AOP-12 (Loss of Containment Integrity)?

- a. HCV-746A (Pressure Relief) is opened.
- b. One of the Personnel Air Lock doors is open.
- c. An unexpected decrease in containment pressure has occurred.
- d. A containment isolation MOV is inoperable but is locked closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 42

1 Point

EOP-06 (Loss of All Feedwater) directs the operators to trip all RCPs. Which one of the following describes the basis for this action?

- a. Flow from the RCPs would interfere with bleed and feed cooling.
- b. Eliminate the RCPs as a source of heat input to the RCS.
- c. Reduce the risk of clad damage due to quenching if a void forms in the vessel.
- d. Allow the stratification of phases so that liquid water remains in the low point (i.e. reactor vessel).

QUESTION 43

1 Point

If E-Bar is 3.301, which one of the following is the highest RCS activity allowed by technical specifications)?

- a. 30.2 $\mu\text{Ci/gm}$.
- b. 38.1 $\mu\text{Ci/gm}$.
- c. 42.1 $\mu\text{Ci/gm}$.
- d. 48.2 $\mu\text{Ci/gm}$.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 44

1 Point

The following conditions exist:

- No operator actions have been taken.
- Core life is near EOL.
- Power level is 80% and increasing.
- Pressurizer level is following its program level.
- T_{ave} is increasing.
- Containment pressure and temperature are normal.
- Pressurizer pressure is normal.
- All systems are in their normal mode.

Which one of the following is the most likely cause of these conditions?

- a. Partial loss of feedwater heating.
- b. Continuous rod withdrawal.
- c. Steam leak outside containment.
- d. Closure of 1 MSIV.

QUESTION 45

1 Point

Which one of the following is the expected response of nuclear power to a dropped CEA?

- a. The effect on power will be negligible but axial peaking factors will increase.
- b. Power will drop approximately 5% (depending on the worth of the CEA) and remain there. Peaking factors will be unaffected.
- c. Power will drop and then return to near the predrop level. Radial peaking factors will increase.
- d. Power will drop and then return to near the predrop level. The Dropped Rod light on the drawer will be extinguished.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 46

1 Point

Which one of the following describes why it is important for the turbine to trip on a reactor trip?

- a. To preserve steam generator inventory.
- b. To prevent excessive cooldown of the RCS.
- c. To prevent turbine damage due to a loss of load overspeed.
- d. To prevent generator damage due to reverse current.

QUESTION 47

1 Point

The following conditions exist:

- The plant is operating at 100% power.
- Quench tank pressure is being maintained at 7 psig.
- The source of the Quench Tank pressure is that Pressurizer Safety Valve (RC-142) is leaking.

Which one of the following is the temperature expected to be seen on Tailpipe Temperature monitor TIA-136?

- a. 150°F
- b. 230°F
- c. 300°F
- d. 640°F

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 48

1 Point

Which one of the following parameters is the most effective in discriminating between a Small Break LOCA and a Steam Line Break Inside Containment?

- a. Containment Pressure
- b. RCS Pressure
- c. Containment Temperature
- d. Steam Generator Pressure

QUESTION 49

1 Point

The following conditions exist:

- A Large Break LOCA has occurred.
- All safeguards components are operating as required.
- The LO on the primary has announced that he has received LO-LO level alarms on both concentrated boric acid tanks.
- SIAS actuated 26 minutes ago.
- SIRWT level is 52 inches,

Which one of the following actions should be taken at this time?

- a. Place two charging pumps in pull stop, open LCV-218-2, close LCV-218-3, close HCV's-265, 268 and 258.
- b. Place all charging pumps in pull stop, close HCV-238, 239, 240, and 249, open HCV-247, 248 and 308.
- c. Close HCV's-265, 258, and 268, open HCV-308 or HCV-2988
- d. Continue Emergency Boration for an additional 4 minutes or until charging pumps lose suction.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 50

1 Point

In a recent plant modification, valve (HCV-438C) CCW Containment Isolation Valve was physically reversed. Which one of the following describes the reason that this modification was necessary?

- a. Eliminate the need to cooldown and depressurize in order to isolate a leaking RCP seal cooler.
- b. To facilitate the replacement of CRDM seals.
- c. The valve was initially installed incorrectly.
- d. To reduce the possibility of waterhammer in the CCW system on CIAS.

QUESTION 51

1 Point

The following conditions exist:

- The plant on Shutdown Cooling.
- The 'A' Shutdown Cooling Heat Exchanger is not available.
- Shutdown cooling is provided through the 'B' Shutdown Cooling Heat Exchanger.
- The plant has been shutdown for 10 days.
- RCS temperature is 120°F.
- The refueling cavity is flooded.
- Containment integrity is not set.
- Cooling water is lost to the operating shutdown cooling heat exchanger.

Which one of following states the amount of time before which containment integrity must be reset.

- a. 8 hours
- b. 15 hours
- c. 24 hours
- d. 48 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 52

1 Point

The reactor is critical at $10^{-4}\%$ power when an inadvertent Emergency Boration Occurs. RCS boron concentration is raised by 10 ppm before it is stopped. Which one of the following describes the effect that this event will have on T_c ?

- a. It will decrease the most at BOL.
- b. It will decrease the most at EOL.
- c. It will decrease the same at EOL as at BOL.
- d. It will not be significantly affected.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 53

1 Point

The plant is at $1 \times 10^{-1}\%$ with a shutdown in progress. As power decreases which one of the following would provide positive Control Room indication that the Wide Range Nuclear Instrumentation System was in the 'Extended Range'?

- a. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- b. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.
- c. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- d. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 54

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- CCW to Detector Well Cooling Containment Isolation valve HCV-467B fails closed.

Which one of the following describes the effect that this will have?

- a. Wide range nuclear instrumentation will swap to extended range.
- b. Primary Rod Position Indication must be declared inoperable.
- c. Variable Overpower Trip (VOPT) pretrip.
- d. The Detector Well Cooling Fans will trip.

QUESTION 55

1 Point

Which one of the following describes the basis for the Technical Specification limits on RCS activity?

- a. To limit Aux building dose rates resulting from a loss of coolant accident.
- b. To limit Aux building dose rates resulting from a fuel handling accident.
- c. To limit offsite doses resulting from a steam generator tube rupture accident.
- d. To limit offsite doses resulting from a loss of feedwater accident.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 56

1 Point

Initiation of LTOP is described in the Floating Step; Blocking of PPLS. Which one of the following states when the LTOP mode of the PORV is enabled?

- a. Whenever the PORV switches are in the AUTO position.
- b. Automatically, whenever pressurizer pressure drops below 1600 psia.
- c. When PPLS is blocked by the Operator.
- d. When RCS temperature is less than 320°F

QUESTION 57

1 Point

The following conditions exist:

- All offsite power has been lost.
- The reactor has tripped.
- EDG #1 did not start and 1A3 is not energized.
- #1 DC bus is deenergized due to a dead short.
- The reason for the EDG failure to start has been corrected.

Which one of the following must be accomplished before the #1 Diesel can be started and loaded?

- a. Start the diesel locally, at AI-133.
- b. Place the diesel back in AUTO.
- c. Transfer DC Control Power to its alternate source.
- d. Start the diesel manually, remotely.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 58

1 Point

The plant is in Mode 1 when the EONA reports that the area monitor in corridor 4 is in alarm and reads 200 mRem/hr. Which one of the following AOPs should be entered as a result of this condition?

- a. None
- b. AOP-08 (Fuel Handling Incident)
- c. AOP-09 (High Radioactivity)
- d. AOP-21 (RCS High Activity)

QUESTION 59

1 Point

The following conditions exist:

- The plant is operating at full power.
- Stack radiation is increasing from the controlled access area of the auxiliary building.
- VCT level is lowering.

Which one of the following compartments is the most likely source of the radioactivity?

- a. Room 21
- b. Corridor 26
- c. The spent fuel storage pool
- d. The letdown heat exchanger room

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 60

1 Point

Which one of the following describes the relationship between plant conditions and indicated vs. actual pressurizer level?

- a. A steam leak in containment will cause indicated level to be higher than actual.
- b. A steam leak in containment will cause indicated level to be lower than actual.
- c. A Steam Generator Tube Rupture will cause indicated level to be higher than actual.
- d. A Steam Generator Tube Rupture will cause indicated level to be lower than actual.

QUESTION 61

1 Point

The following conditions exist:

- Fuel handling operations are in progress.
 - Personnel are working both in Containment and the Aux Building.
 - An Aux Building stack monitor alarms.
 - This initiates VIAS.
 - Area Monitor (RM-087) Spent Fuel Pool Wall alarms. Which one of the following actions should be taken?
- a. Reset and restart containment cooling.
 - b. Verify containment integrity is set.
 - c. Evacuate the Aux Building.
 - d. Trip all Aux Building Exhaust Fans.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 62

1 Point

Following a loss of offsite power pressurizer level is to be maintained above 45%. Which one of the following is the reason that this is necessary?

- a. Assure continued heater operation to preserve subcooling.
- b. Assure adequate pressurizer level for RCP start when power is restored.
- c. Assure adequate RCS inventory during any subsequent cooldown.
- d. Assure adequate inventory for reflux boiling if loss of power is prolonged.

QUESTION 63

1 Point

Which one of the following events would require the immediate termination of any Waste Gas Release in progress?

- a. Containment area monitor alarm.
- b. Stack radiation monitor alarm.
- c. Failure of a containment gas monitor.
- d. Failure of the waste gas flow rate recorder.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 64

1 Point

In the course of conducting a Valve Alignment Verification Checklist, the operator discovers that a particular valve is not in the position called for in the checklist. Which one of the following actions should be taken concerning this valve?

- a. Reposition the valve to the position specified in the checklist.
- b. Place a Caution Tag on the valve.
- c. Inform the Security Shift Supervisor and request an investigation.
- d. Contact the control room for further instructions.

QUESTION 65

1 Point

FW-2B has been tagged out of service for both mechanical and electrical work using a group tagout. The Electrical Group Foreman has requested a temporary clearance to perform some testing on the motor. In addition to the Shift Supervisor, who must approve this temporary clearance?

- a. All persons listed on Attachment 1 to the Group Tagout Sheet.
- b. All persons involved in the testing of the motor.
- c. The maintenance planners involved with both the electrical and the mechanical work.
- d. The Duty Supervisor.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 66

1 Point

The RWP Surveillance and ALARA coordinator has determined that an ALARA job briefing is required for performance of a job in the RCA. Which one of the following restrictions apply until all affected workers attend an ALARA Job Briefing?

- a. TLDs may not be issued to affected workers.
- b. Workers may not sign the RWP.
- c. Workers may not enter the protected area.
- d. The Work Order may not be approved.

QUESTION 67

1 Point

Under which one of the following circumstances may a non-licensed member of the Plant Review Committee (PRC) enter the control room without receiving permission from the Shift Supervisor, LSO, or Licensed Operator?

- a. At any time.
- b. During Shift Turnover.
- c. Under Emergency Conditions.
- d. During a plant outage.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 68

1 Point

Which one of the following jobs require the use of a Ground Fault Circuit Interrupter (GFIC)?

- a. Rescue of an injured worker from a live electrical circuit.
- b. Replacing light bulbs in indoor light fixtures.
- c. Using a portable grinder on a piece of stainless steel near the SIRWT.
- d. Working on a de-energized electrical bus.

QUESTION 69

1 Point

In the event of a total loss of feedwater following a reactor trip on low steam generator level from full power, which one of the following specifies the minimum expected time that steam generator inventory can be relied upon to provide a heat sink?

- a. 10 minutes
- b. 20 minutes
- c. 40 minutes
- d. 60 minutes

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 70

1 Point

In responding to an oil spill and fire within the RCA, which one of the following serves as the Incident Commander?

- a. Any Radiation Protection Tech trained in fire fighting.
- b. The Plant Industrial Safety Coordinator.
- c. The Shift SRO.
- d. A Shift RO.

QUESTION 71

1 Point

Which one of the following CANNOT be used to determine the current revision of a procedure?

- a. Check with Document Control.
- b. Use the On-line CHAMPS index.
- c. Check an official copy at locations listed in SO-G-7.
- d. Check Attachment 1 to SO-G-7.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 72

1 Point

Which one of the following conditions requires that EOP-00 be referenced but NOT entered?

- a. RPS actuation following a manual reactor shutdown with T_c at 520°F.
- b. A reactor trip from 1% power with the generator off-line.
- c. A manual reactor trip from full power.
- d. RPS actuation while on shutdown cooling with T_c at 260°F.

QUESTION 73

1 Point

When using the Gaitronics System, which one of the following channels is reserved for operations department use?

- a. Line 1
- b. Line 2
- c. Line 3
- d. Line 4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 74

1 Point

Following a CIAS, a containment isolation valve which should have closed is stuck in the open position. How will this condition be indicated on the appropriate ERF Computer display page?

- a. The screen symbol for the valve will be green and steady.
- b. The screen symbol for the valve will be green and flashing.
- c. The screen symbol for the valve will be red and steady.
- d. The screen symbol for the valve will be red and flashing.

QUESTION 75

1 Point

An RO initiated a containment vent but did not remember to log it for several hours. Which one of the following is the correct way for this entry to be made?

- a. Insert the entry such that the sequence of events on the page is correct.
- b. Make a normal log entry marking it as a late entry in the time column.
- c. Make a normal log entry and then draw a line to the page location where it should have been entered initially.
- d. No action is required. Containment vents do not need to be logged.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 76

1 Point

With no RCPs running and Tc less than 385°F, Limiting Condition for Operation 2.1.1 prohibits starting an RCP unless:

- Pressurizer steam volume is >53% OR
- ΔT between Tc and S/G is <30°F.

Which one of the following describes the potential consequence of failure to obey this requirement?

- a. Decrease in Shutdown Margin due to introduction of cold water into the core.
- b. Pressurizer outsurge and uncovering of pressurizer heaters.
- c. Overpressure transient caused by thermal expansion from reverse steam generator heat transfer.
- d. RCP damage due to inadequate NPSH.

QUESTION 77

1 Point

In the event of a CIAS, RCP Seal Leakage flow will be directed to which one of the following destinations?

- a. None, seal flow is isolated.
- b. VCT.
- c. RCDT.
- d. Containment Sump.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 78

1 Point

Assuming that the initiating signal is still present, which one of the following letdown isolations can be temporarily overridden by holding the Letdown Isolation Valve (TCV-202) switch in the OPEN position?

- a. High Temperature.
- b. High Flow
- c. CIAS
- d. None - a letdown isolation cannot be overridden in this manner.

QUESTION 79

1 Point

The following plant conditions exist:

- A normal plant cooldown is in progress.
- The PPLS Block switches have been placed in the BLOCK position.
- RCS pressure is 1650 psia.
- Pressurizer heaters are inadvertently energized and pressure rises to 1850 psia.
- The heaters are then deenergized and RCS pressure is rapidly reduced to 1570 psia.

Which one of the following undesired auto actions is most likely to occur as a result of this sequence of events?

- a. No undesired auto actions should occur.
- b. SIAS but not CIAS.
- c. CIAS but not SIAS.
- d. Both SIAS and CIAS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 80

1 Point

What design feature of the RPS prevents placing two TM/LP trip units in bypass at the same time?

- a. When a trip unit is bypassed with the bypass key, contacts open in the logic ladder which prevent bypassing another TM/LP trip unit.
- b. Only one channel can be selected using the bypass key to operate the 5-position TM/LP trip bypass switch.
- c. Only one TM/LP trip unit can be tripped at a time since there is only one TM/LP trip unit bypass key.
- d. No design feature is provided. Bypassing two trip units is prevented by administrative control.

QUESTION 81

1 Point

The plant is operating at 50% power with the Channel A High Power trip unit in bypass. Which one of the following describes the effect of deenergizing another High Power Trip Unit?

- a. The reactor will trip.
- b. The reactor will trip only if the deenergized drawer is Channel C.
- c. No reactor trip will occur but trip logic becomes 2 of 2.
- d. No reactor trip will occur but trip logic becomes 1 of 2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 82

1 Point

The containment cooler inlet and outlet valves (HCV-400A/C, 401A/C, 402A/C, and 403A/C) will automatically close following a CIAS if which one of the following conditions exists?

- a. CCW pump discharge pressure is less than 60 psig.
- b. A containment pressure high signal [CPHS] is not present.
- c. The fan associated with the containment cooling unit fails to start within 50 seconds.
- d. There is low CCW flow from the containment cooler.

QUESTION 83

1 Point

The plant is operating at full power when Steam Generator Level Detector (LT-903) fails high. Which one of the following describes the expected response of the affected steam generator's Feed Reg Valve?

- a. It will shift to manual control and remain as is.
- b. It will shift to manual control and close and remain closed until reopened by the operator.
- c. It will shift to manual control, close and then shift back to auto and re-open to its original position.
- d. It will remain in auto but go closed and remain fully closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 84

1 Point

Prior to starting AFW pump (FW-6) from control board sections CB-10,11, you must first perform which one of the following actions?

- a. Verify HCV-1384 is open.
- b. Verify no EFWST level alarms.
- c. Verify its recirc valve is open.
- d. Verify switch FW/43 is in OFF.

QUESTION 85

1 Point

The following plant conditions exist:

- A steam leak upstream of the MSIV on the A S/G has occurred.
- Pressure in the A S/G is 480 psia.
- Level in the A S/G is 30%(WR).
- Pressure in the B S/G is 575 psia.
- Level in the B S/G is 60%(WR).
- The MSIVs are closed.

Which one of the following is the current status of the AFW system?

- a. AFW should be feeding the A S/G.
- b. AFW should be feeding the B S/G.
- c. AFW should be feeding both S/Gs.
- d. AFW should not have initiated yet.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 86

1 Point

An alarm on RM-054B (Steam Generator Blowdown Monitor for 'B' Steam Generator) will affect S/G blowdown and sample flows in which one of the following ways?

- a. Blowdown and sample flow will be automatically isolated from the 'B' S/G only.
- b. Blowdown flow will be automatically isolated from the 'B' S/G only. Sample flow will be unaffected.
- c. Blowdown and sample flow will be automatically isolated from both S/Gs.
- d. Blowdown flow will be automatically isolated from both S/Gs. Sample flow will be unaffected.

QUESTION 87

1 Point

Which one of the following conditions requires entry into AOP-22 (Reactor Coolant Leak)?

- a. CRDM Seal leakage is 0.8 gpm.
- b. CRDM Seal leakage is 1.2 gpm.
- c. Unidentified leakage is 0.8 gpm.
- d. Unidentified leakage is 1.2 gpm

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 88

1 Point

The 120 VAC power supply to AI-196 has been lost. Which one of the following describes the method or ability to bypass Diverse Scram System Channel A?

- a. Place the TEST/BYPASS switch on AI-196 to the bypass position.
- b. Place the TEST/BYPASS switches on both panels to the bypass position.
- c. It is not possible to bypass a single sensor channel on loss of 120 VAC power.
- d. The DSS channel will automatically bypass on loss of 120 VAC power.

QUESTION 89

1 Point

A reactor startup is in progress when a Group 1 rod drops into the core. Which one of the following actions is required as a result of this event?

- a. The dropped rod must be recovered.
- b. Emergency boration must be initiated.
- c. All regulating group rods must be inserted.
- d. The reactor must be tripped.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 90

1 Point

Which one of the following instrument errors would cause the reactor power calculated by XC-105 to be less than actual reactor power?

- a. Turbine first stage pressure indicating lower than actual.
- b. Feedwater temperature indicating higher than actual.
- c. Feedwater flow indicating higher than actual.
- d. Main generator electrical output indicating less than actual.

QUESTION 91

1 Point

In the Vital Auxiliaries portion of EOP-20; Functional Recovery, operators are instructed to maintain S/G level above 85%. Which one of the following is the reason that this is desirable?

- a. Prevents dryout of AFW nozzles
- b. Reduces thermal stress on the feed ring.
- c. Minimizes the chance of feed ring damage due to waterhammer.
- d. Provides an inventory surplus to support electric feed pump restoration.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 92

1 Point

The plant is operating at steady state full power when level in one steam generator is seen to decrease. Which one of the following is a possible cause of this decrease?

- a. Electrical control power has been lost to the affected S/G's Feed Reg Valve.
- b. Control Air pressure has been lost to the affected S/G's Feed Reg Valve.
- c. Steam pressure has failed low on the affected side.
- d. Steam flow has failed high on the affected side.

QUESTION 93

1 Point

Which one of the following combinations of white lights on AI-41A/B is an indication of a ground on the 125 VDC system?

- a. Both bright.
- b. One bright, one off.
- c. Both off.
- d. Both dim.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 94

1 Point

The plant is operating normally at power when a transformer failure causes the voltage on bus 1A3 to decrease to 3000 VAC. Which one of the following describes the response of the OPLS?

- a. No OPLS will be generated.
- b. OPLS will start Diesel Generator #1.
- c. OPLS will start Diesel Generator #2.
- d. OPLS will start both Diesel Generators.

QUESTION 95

1 Point

Which one of the following is capable of providing a source of fire main water if the fire system pumps are inoperable?

- a. Screen wash pumps.
- b. Seal water pumps.
- c. Raw water pumps.
- d. Circulating water pumps.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 96

1 Point

Fire protection coverage for the containment charcoal filters has recently changed. Which one of the following describes the current fire protection scheme for these filters?

- a. The containment spray system is physically available but is not to be used to combat fires.
- b. The containment spray system has been physically connected to the filters and is now to be used to combat fires.
- c. The containment spray system has been physically disconnected from the filters.
- d. The containment spray connection has been replaced by a dedicated CO₂ system.

QUESTION 97

1 Point

The plant is at 25% power when the Main Turbine trips followed by a Reactor trip. Which one of the following valves, if it failed closed, is a possible cause of this event?

- a. The #1 Turbine Stop Valve.
- b. The #1 Turbine Control Valve.
- c. The #2 Turbine Control Valve.
- d. MSIV HCV-1042A.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 98

1 Point

The plant is operating at 20% power when a PDIL Rod Block occurs. Which one of the following instrument failures could be the cause of this event?

- a. T-cold instrument fails high.
- b. T-hot instrument fails high.
- c. Power Range NI instrument fails low.
- d. Wide Range NI instrument fails low.

QUESTION 99

1 Point

All Raw Water flow has been lost to the CCW heat exchangers. Once the plant is tripped, which one of the following describes the best RCS cooling/pressure control mode allowed under these circumstances?

- a. Forced convection with 4 RCPs since RCP cooling will be unaffected.
- b. Forced convection with 3 RCPs since CCW can usually support the operation of 3 RCPs for a significant period.
- c. Forced convection with 1 RCP per loop since CCW can usually support the operation of 2 RCPs for a significant period.
- d. Once through cooling due to loss of ability to enter shutdown cooling.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

REACTOR OPERATOR EXAMINATION

QUESTION 100

1 Point

The following plant conditions exist:

- An Alert has been declared.
- No release of radioactive material has occurred.
- A Plant Evacuation has been declared.

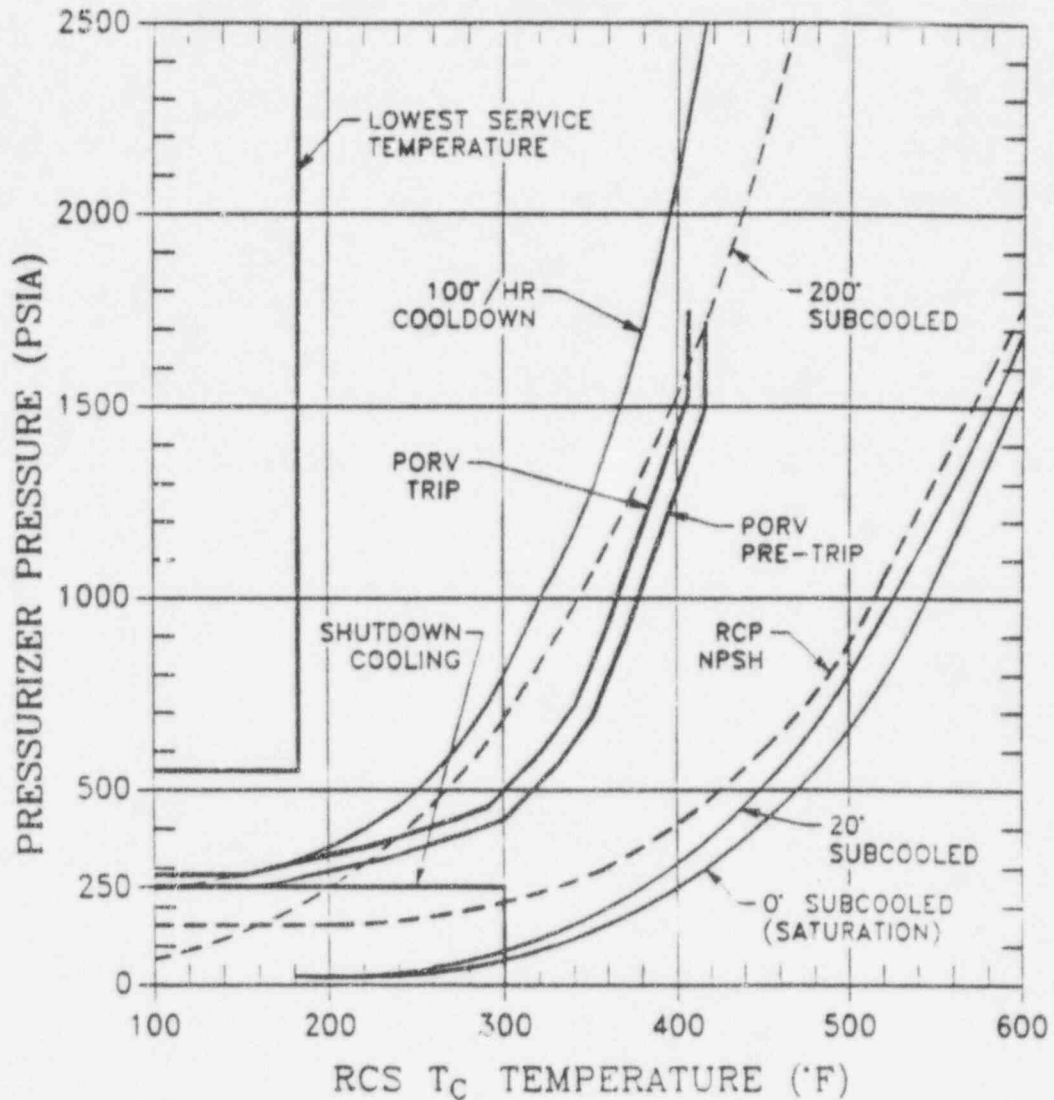
Under these conditions, all non-essential personnel should follow which one of the following evacuation routes?

- a. To the North Omaha Power Station via the Normal Security Access Point.
- b. To the North Omaha Power Station via the North Security Access Point.
- c. To the Admin Building via the Normal Security Access Point.
- d. To the Admin Building via the South Security Access Point.

***** END OF EXAMINATION *****

Attachment 2

RCS Pressure-Temperature Limits



NOTES

1. This curve is only valid through 20 EFPY.
2. 200°F subcooled curve supersedes 100°/HR cooldown curve anytime RCS has experienced an uncontrolled cooldown causing RCS temperature to go below 500°F.
3. To be the most conservative during forced circulation, T_n , or during natural circulation, CETs should be used for the 20°F subcooled and the saturation curve. T_c should be used for all other curves.

2.0 LIMITING CONDITIONS FOR OPERATION
2.4 CONTAINMENT COOLING

Applicability

Applies to the operating status of the containment cooling systems.

Objective

To assure operability of equipment required to remove heat from the containment during normal operating and emergency situations.

Specifications

(1) Minimum Requirements

- * a. The reactor shall not be made critical, except for low-temperature physics tests, unless all the following are met:
- ** 1. The following equipment normally associated with diesel-generator 01 (4.16-kV bus 1A3 and associated non-automatically transferring 480-Volt bus sections) is operable, except as noted:⁽¹⁾
- | | |
|--|--------|
| Raw water pump | AC-10A |
| Raw water pump | AC-10C |
| Component cooling water pump | AC-3A |
| Component cooling water pump | AC-3C |
| Containment spray pump | SI-3A |
| Containment air cooling and filtering unit | VA-3A |
| Containment air cooling unit | VA-7C |
- ** 11. The following equipment normally associated with diesel-generator 02 (4.16-kV 1A4 and associated non-automatically transferable 480 Volt bus sections) is operable, except as noted.⁽¹⁾
- | | |
|--|--------|
| Raw water pump | AC-10B |
| Raw water pump | AC-10D |
| Component cooling water pump | AC-3B |
| Containment spray pump | SI-3B |
| Containment air cooling and filtering unit | VA-3B |
| Containment air cooling unit | VA-7D |
| Containment spray pump | SI-3C |
- ** 111. All heat exchangers, valves, piping and interlocks associated with the above components and required to function during accident conditions are operable.
- ***
- (1) Reactor may be made critical with one inoperable raw water pump. LCD action statements shall apply.

* SEE TSI-93-03

** SEE TSI-94-09

*** SEE TSI-95-09

2.0 LIMITING CONDITIONS FOR OPERATION
2.4 CONTAINMENT COOLING (CONTINUED)

- b. During power operating one of the components listed in (1)a.1. and 11. may be inoperable. If the inoperable component is not restored to operability within seven days, the reactor shall be placed in hot shutdown condition within 12 hours. If the inoperable component is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.
- c. For cases involving Raw Water pump inoperability, if the river water temperature is below 60 degrees Fahrenheit, one Raw Water pump may be inoperable indefinitely without applying any LCO action statement. When the river water temperature is greater than 60 degrees Fahrenheit, an inoperable Raw Water pump shall be restored to operability within 7 days or the reactor shall be placed in a hot shutdown condition within 12 hours. If the inoperable Raw Water pump is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

(2) Modification of Minimum Requirements

During power operation, the minimum requirements may be modified to allow a total of two of the component listed in (1)a.1. and 11. to be inoperable at any one time (this does not include one Raw Water pump which may be inoperable as described above if the river water temperature is below 60 degrees Fahrenheit). Only two raw water pumps may be out of service during power operations. If the operability of one component is not restored within 24 hours, the reactor shall be placed in a hot shutdown condition within 12 hours. LCD 2.4(1)b. shall be applied if one of the inoperable components is restored within 24 hours. If the operability of both components is not restored within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

Any valves, interlocks and piping directly associated with one of the above components and required to function during accident conditions shall be deemed to be part of that component and shall meet the same requirements as for that component.

Any valve, interlock or piping associated with the containment cooling system which is not included in the above paragraph and which is required to function during accident conditions

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINMENT COOLING (CONTINUED)

may be inoperable for a period of no more than 24 hours.
If operability is not restored within 24 hours, the reactor
shall be placed in a hot shutdown condition within 12 hours.

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems

Applicability

Applies to the availability of electrical power for the operation of plant components.

Objective

To define those conditions of electrical power availability necessary to provide for safe reactor operation and the continuing availability of engineered safety features.

Specifications

(1) Minimum Requirements

The reactor shall not be heated up or maintained at temperatures above 300°F unless the following electrical systems are operable:

- a. Unit auxiliary power transformers TIA-1 or -2 (4,160 V).
- b. House service transformers TIA-3 and 4 (4,160 V).
- c. 4,160 V engineered safety feature buses 1A3 and 1A4.
- d. 4,160 V/480 V Transformers TIB-3A, TIB-3B, TIB-3C, TIB-4A, TIB-4B, TIB-4C.
- e. 480 V distribution buses 1B3A, 1B3A-4A, 1B4A, 1B3B, 1B3B-4B, 1B4B, 1B3C, 1B3C-4C, 1B4C.
- f. MCC No. 3A1, 3B1, 3A2, 3C1, 3C2, 4A1, 4A2, 4C1 and 4C2.
- g. 125 V d-c buses No. 1 and 2 (Panels EE-8F and EE-8G).
- h. 125 V d-c distribution panels AI-41A and AI-41B.
- i. 120V a-c instrument buses A, B, C, and D (Panels AI-40-A, B, C and D).
- * j. 120V a-c instrument panels AI-42A and AI-42B.
- k. Station batteries No. 1 and 2 (EE-8A and EE-8B) including one battery charger on each 125V d-c bus No. 1 and 2 (EE-8F and EE-8G).
- l. Two emergency diesel generators (DG-1 and DG-2).
- m. One diesel fuel storage system containing a minimum volume of 16,000 gallons of diesel fuel in FO-1, and an additional 8,000 gallons of diesel fuel in FO-10.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

(2) Modification of Minimum Requirements

The minimum requirements may be modified to the extent that one of the following conditions will be allowed after the reactor coolant has been heated above 300°F. However, the reactor shall not be made critical unless all minimum requirements are met. If any of the provisions of these exceptions are violated, the reactor shall be placed in a hot shutdown condition within the following 12 hours. If the violation is not corrected within an additional 12 hours, the reactor shall be placed in a cold shutdown condition within an additional 24 hours.

- a. Both unit auxiliary power transformers T1A-1 and -2 (4.16 kV) may be inoperable for up to 24 hours provided the operability of both diesel generators is demonstrated immediately.
- b. Either house service transformer T1A-3 or T1A-4 (4.16kV) may be inoperable for up to 7 days provided the operability of the diesel generator associated with the inoperable transformer is immediately verified. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 7 days is permissible, provided a special report is submitted to the NRC within 48 hours after transformer inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of transformer operability and the additional precautions to be taken while the transformer is out of service.
- c. Both house service transformers T1A-3 and T1A-4 (4.16kV) may be inoperable for up to 72 hours provided the operability of both diesel generators is immediately verified. The loss of the 161kV incoming line renders both transformers inoperable. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 72 hours is permissible, provided a special report is submitted to the NRC within 48 hours after both transformers' inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of the transformers' operability and the additional precautions to be taken while the transformers are out of service.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

- d. Either one of the 4.16kV engineered safeguards buses, 1A3 or 1A4 may be inoperable for up to 8 hours provided the operability of the diesel generator associated with the operable bus is demonstrated immediately and there are no inoperable required engineered safeguards components associated with the operable bus.
- e. One of each group of 4160 V/480 V Transformers (T1B-3A or 4A), (T1B-3B or 4B), and (T1B-3C or 4C) may be inoperable for up to 8 hours provided there are no inoperable required engineered safeguards components which are redundant to components on the inoperable transformer.
- f. One of the 480 V distribution buses connected to bus 1A3 or connected to bus 1A4 may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus.
- g. Either Group of MCC No.'s (3A1, 3B1, 3A2, 3C1, 3C2,) or (4A1, 4A2, 4C1, 4C2) may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable MCC. MCC 3C1 may be inoperable in excess of 8 hours if battery chargers No. 1 and No. 2 are operable.
- h. One of the four 120V a-c instrument buses (A, B, C or D) may be inoperable for 8 hours provided the reactor protective and engineered safeguards systems instrument channels supplied by the remaining three buses are all operable.
- i. Two battery chargers may be inoperable for up to 8 hours provided battery charger No. 1 (EE-8C) or No. 2 (EE-8D) is operable.
- *
**
*** j. Either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to seven days (total for both) during any month, provided there are no inoperable required engineered safeguards components associated with the operable diesel generator. If one diesel generator is inoperable, within 8 hours (regardless of when the inoperable diesel generator is restored to operability) EITHER:
 - (1) Start the other diesel generator to verify operability, OR
 - (2) Ensure the absence of common cause for the diesel generator inoperability for the other diesel generator.
- k. If inventory of diesel fuel in FO-1 is less than 16,000 gallons and/or FO-10 is less than 8,000 gallons, but the combined inventory in FO-1 and FO-10 is greater than a 6 day supply (21,350 gallons), then restore the required inventory within 48 hours.

* See TSI-92-13
** See TSI-94-06
*** See TSI-92-03

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems (Continued)

- l. Island buses 1B3A-4A, 1B3B-4B, and 1B3C-4C may be inoperable for up to 8 hours provided there are no inoperable required safeguardis components which are redundant to components on the inoperable bus(es).
- m. Either one of the 125V d-c buses No. 1 or 2 (Panels EE-8F or EE-8G) may be inoperable for up to 8 hours.
- n. Either one of the 125V d-c distribution panels AI-41A or AI-41B may be inoperable for up to 8 hours.
- o. Either one of the 120V a-c instrument panels AI-42A or AI-42B may be inoperable for up to 8 hours.

APPENDIX B
TECHNICAL SPECIFICATION INTERPRETATION

TSI- 92-13

TECHNICAL SPECIFICATION REFERENCE: 2.7

TECHNICAL SPECIFICATION PAGE NO.: 2-34

PARAGRAPH/TABLE/ITEM: 2.7(2)1.

INTERPRETATION:

Technical Specification states, "either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to 7 days (total for both) during any month,...." "During any month" is interpreted to mean during any calendar month. The 7 day LCO clock restarts with the beginning of a new month. This is not, however, to be construed as allowing any single diesel outage to exceed 7 days by overlapping outage time at the end of one month with the outage time allowed for a new month.

BASES:

Question was posed to NRC Project Manager, Wayne Walker, who conferred on this issue with NRC-NRR. The NRC is in agreement with this interpretation provided that the 7 day overall limit is not exceeded.

**PRC RECOMMENDS
APPROVAL**

OCT 15 1992

PRC MTG. MINUTES

REFERENCES:

T: 1
6. CONCURRENCE: Wayne Walker DATE: 10-1-92
Manager - NL&IA

7. APPROVED: J. Spahr DATE: 10-15-92
Chairman - PRC

Figure II.A.4
Cycle 16 Inverse Boron Worth vs Burnup

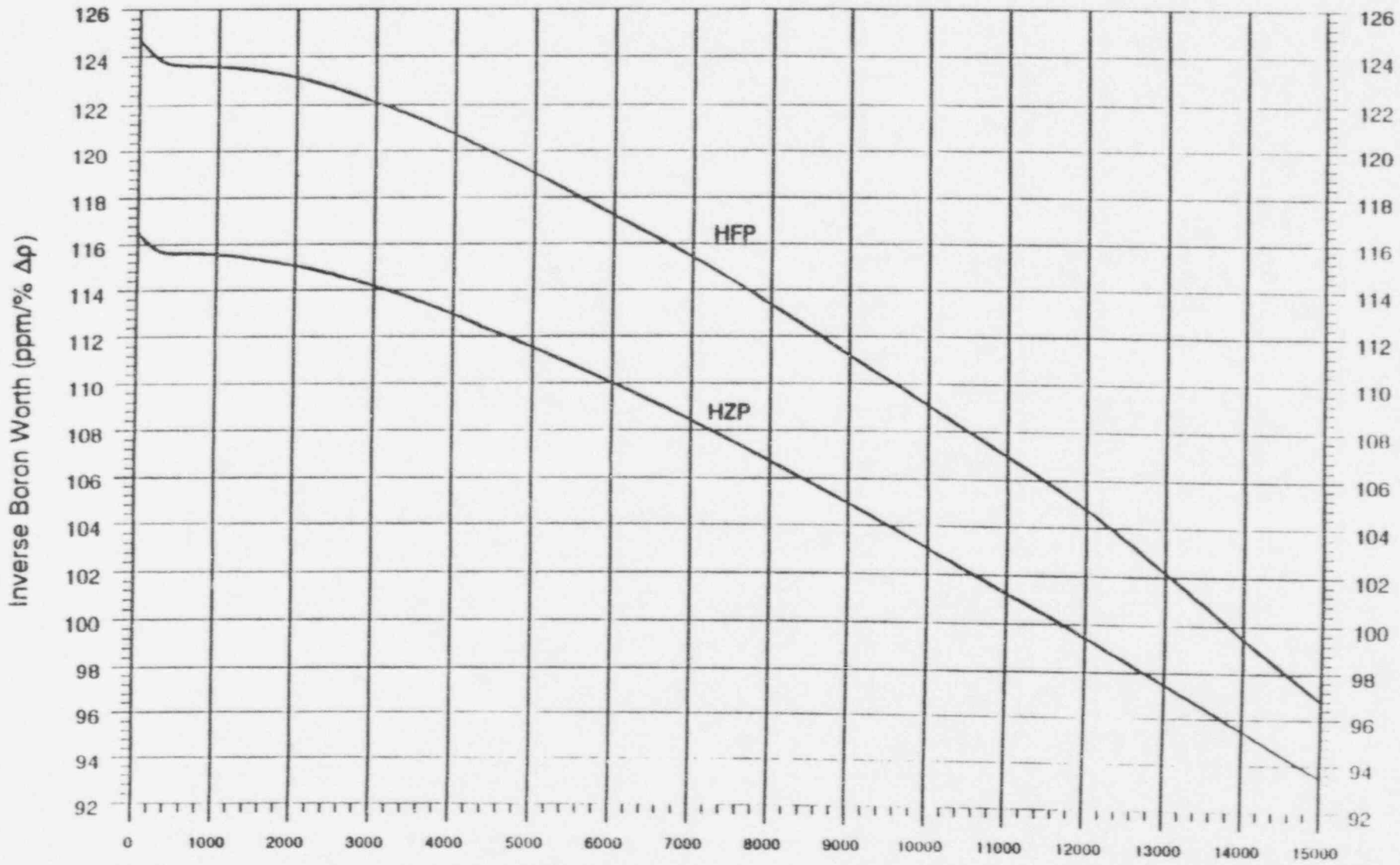
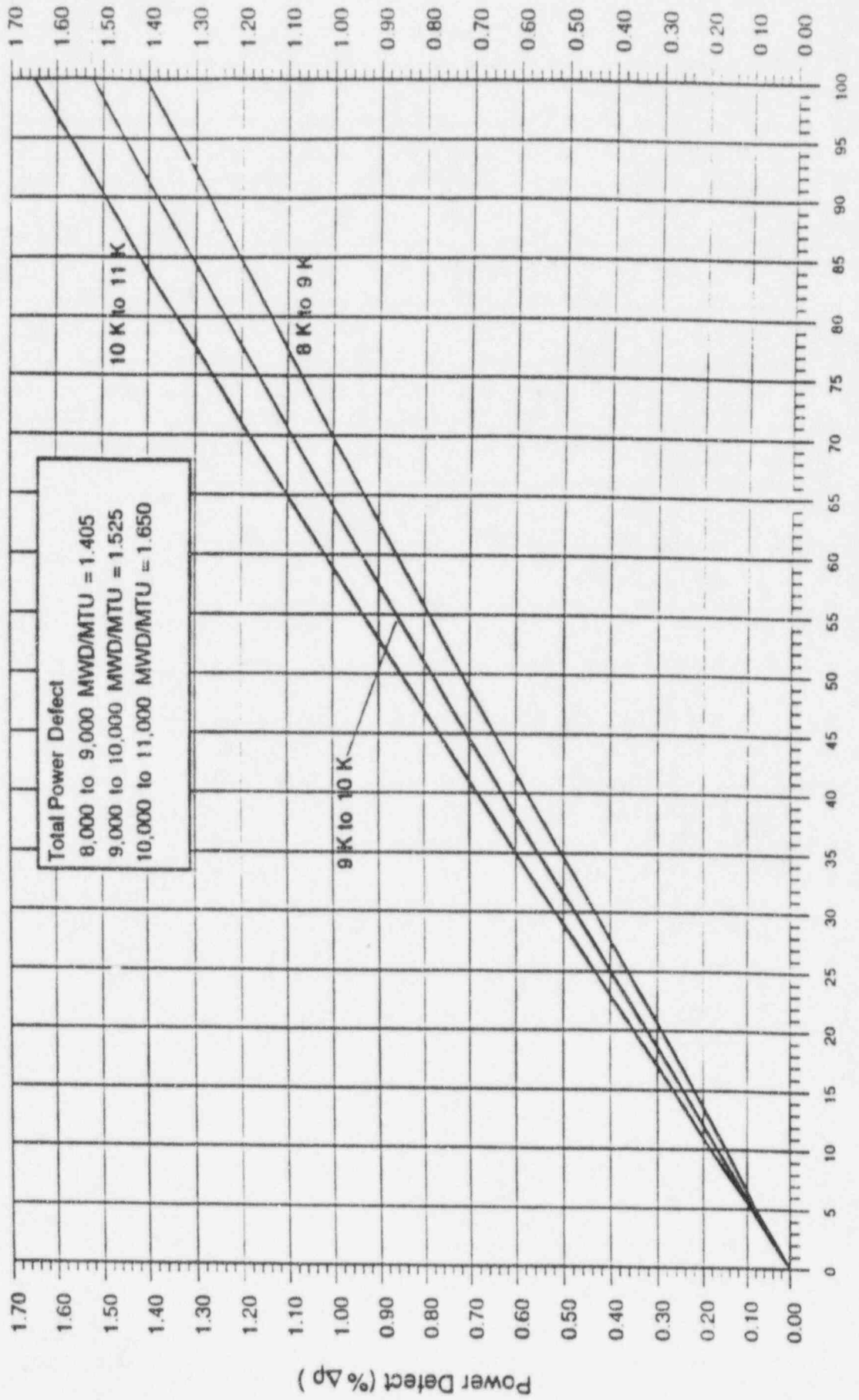


Figure II.C.2.b
Cycle 16 Total Power Defect vs Power
 (8,000 to 11,000 MWD/MTU)



Attachment B

Time to Boil Determination Worksheet

1. Time Shutdown Cooling was lost: _____
2. Last known RCS/SDCS temperature: _____ °F
from instrument number: _____
3. Record the following information and inform the Shift Supervisor on 10 minute intervals

TIME	CET/HJTC °F	HEATUP RATE	TIME TO BOIL

Alternate Method: $T_b = T_a + T_0 - T_c$
 Where T_b is the remaining time to boil
 T_a is the approximate time to boil from the appropriate curve
 T_0 is the time SDC was lost
 T_c is the current time

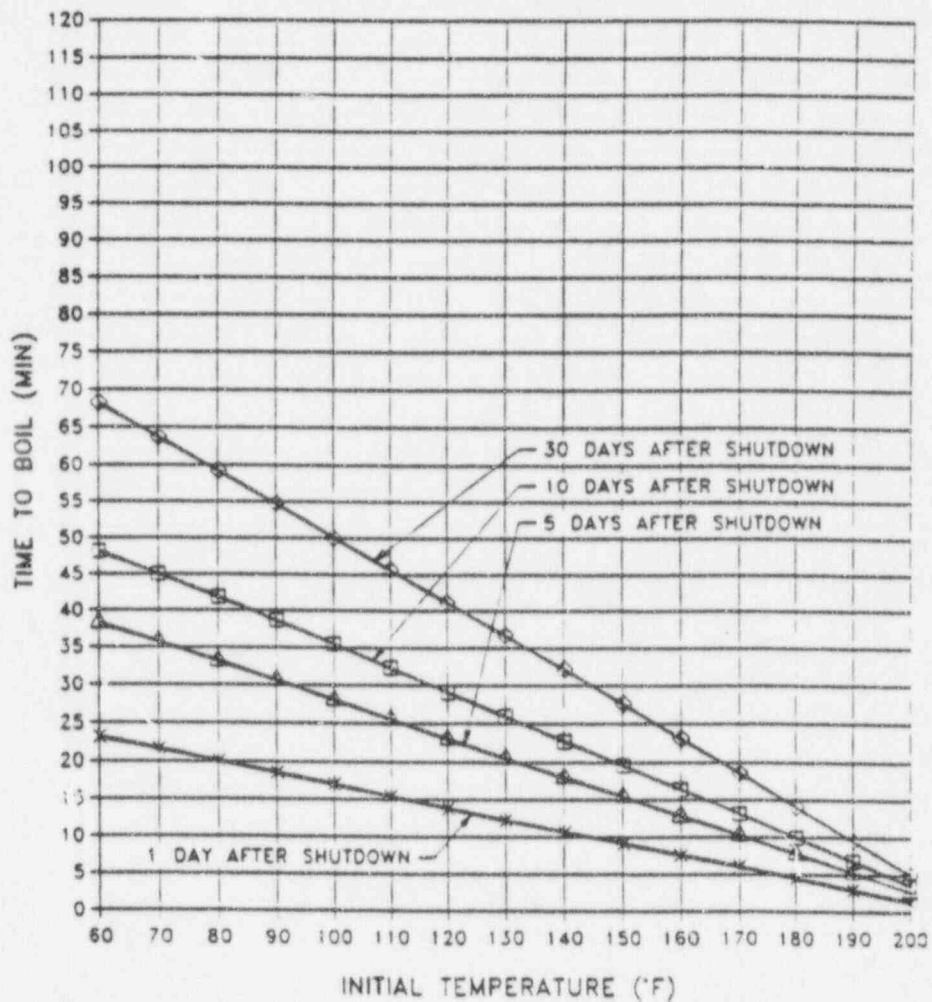
Attachment B

Time to Boil Determination

Time to Boil (RCS at Mid Loop)

APPROXIMATE TIME TO BOIL

RCS AT MID LOOP CONDITIONS



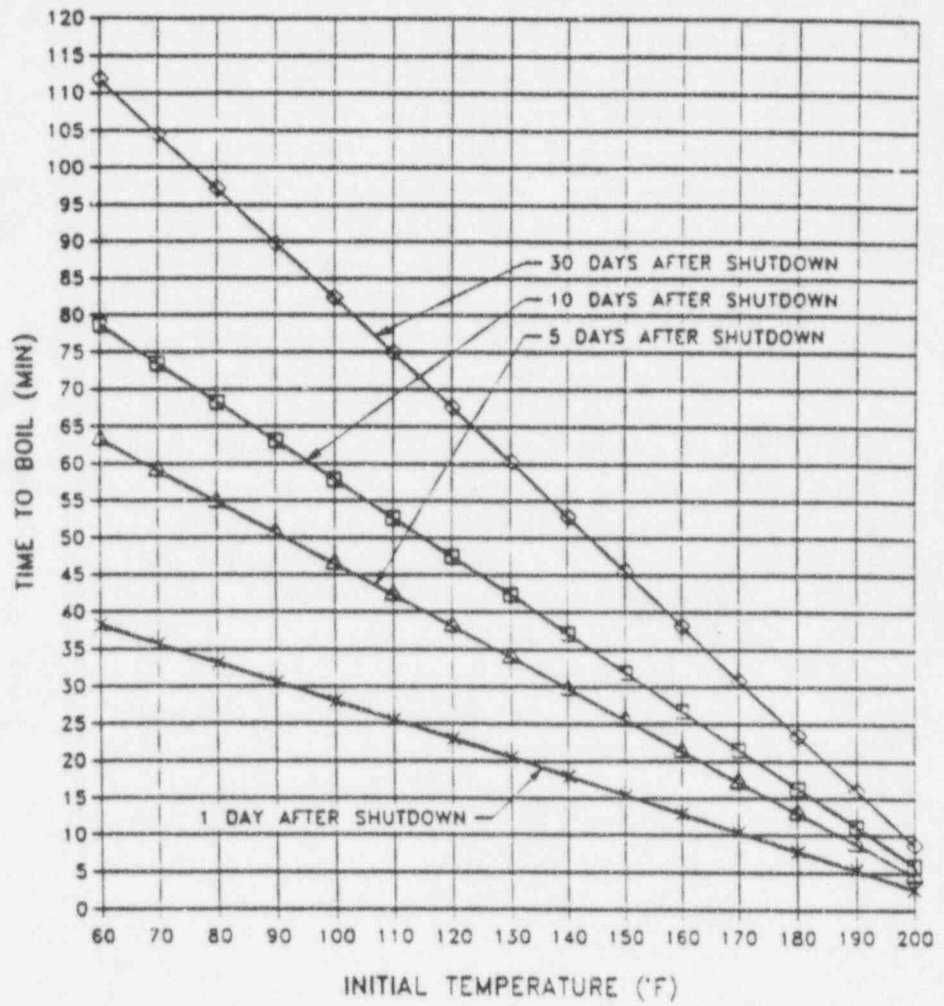
Attachment B

Time to Boil Determination

Time to Boil (RCS at Reactor Vessel Flange)

APPROXIMATE TIME TO BOIL

RCS AT REACTOR VESSEL FLANGE LEVEL CONDITIONS



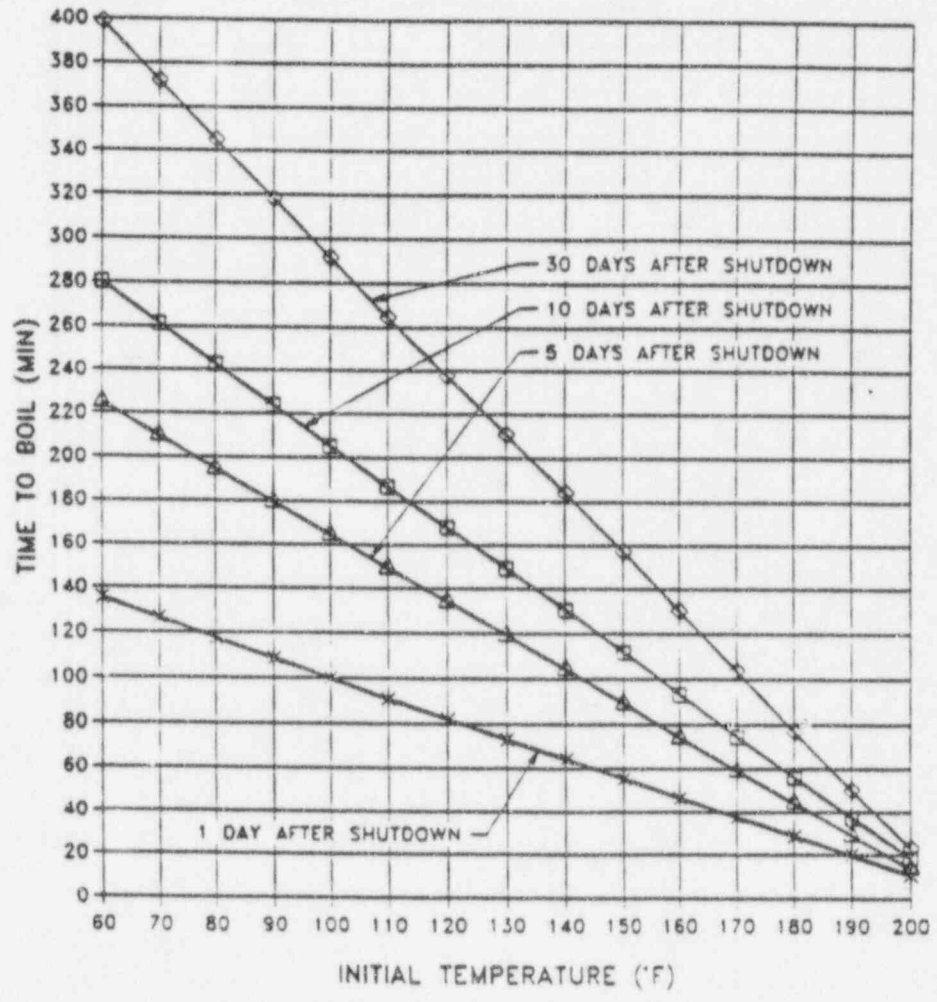
Attachment B

Time to Boil Determination

Time to Boil (RCS at Normal Operating Volume)

APPROXIMATE TIME TO BOIL

RCS AT NORMAL OPERATING LIMITS



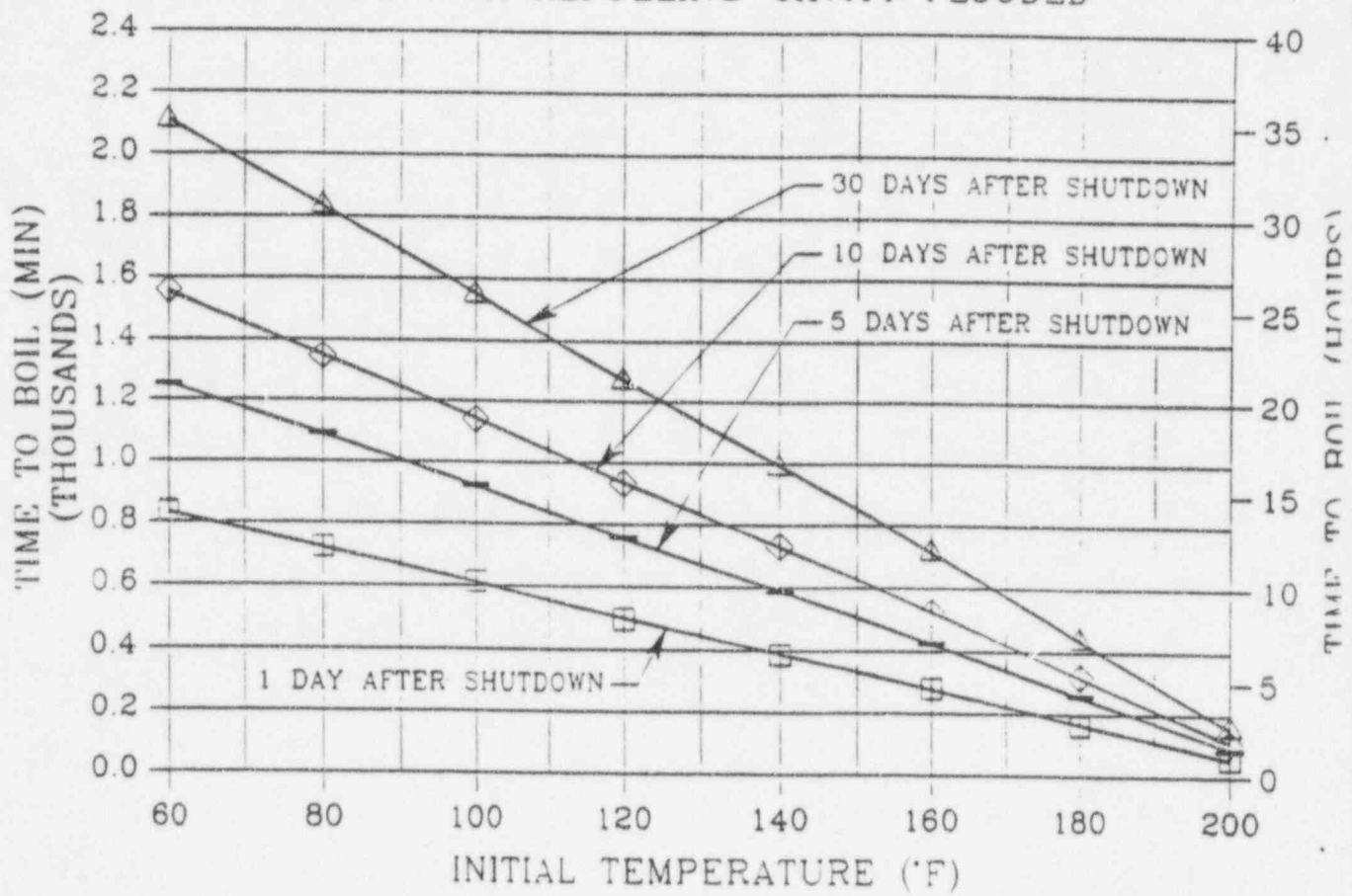
Attachment B

Time to Boil Determination

Time to Boil (Refueling Cavity Flooded)

APPROXIMATE TIME TO BOIL

RCS WITH REFUELING CAVITY FLOODED



End of Attachment B

**U. S. NUCLEAR REGULATORY COMMISSION
SITE-SPECIFIC
WRITTEN EXAMINATION**

APPLICANT INFORMATION

Name: <u>Key</u>	Region: I / II / III / <u>IV</u> / V
Date: <u>12/04/95</u>	Facility/Unit: <u>Fort Calhoun</u>
License Level: RO / <u>SRO</u>	Reactor Type: W / <u>CE</u> / BW / GE

INSTRUCTIONS

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires a final grade of at least 80 percent. Examination papers will be picked up 4 hours after the examination starts.

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

Applicant's Signature

RESULTS

Examination Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

1. Cheating on the examination will result in a denial of your application and could result in more severe penalties.
2. After you complete the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination.
3. To pass the examination, you must achieve a grade of 80 percent or greater.
4. The point value for each question is indicated in parentheses after the question number.
5. There is a time limit of 4 hours for completing the examination.
6. Use only black ink or dark pencil to ensure legible copies.
7. Print your name in the blank provided on the examination cover sheet and the answer sheet.
8. Mark your answers on the answer sheet provided and do not leave any question blank.
9. If the intent of a question is unclear, ask questions of the examiner only.
10. Restroom trips are permitted, but only one applicant at a time will be allowed to leave. Avoid all contact with anyone outside the examination room to eliminate even the appearance or possibility of cheating.
11. When you complete the examination, assemble a package including the examination questions, examination aids, and answer sheets and give it to the examiner or proctor. Remember to sign the statement on the examination cover sheet.
12. After you have turned in your examination, leave the examination area as defined by the examiner.

Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

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Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

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100 a b c d ----

SRO ANSWER KEY

- | | | | |
|----------------|----------------------------|-------|----------------|
| (1) | A | (52) | D |
| (2) | B <i>delete</i> | (53) | C |
| (3) | B | (54) | C |
| (4) | C | (55) | C |
| (5) | A | (56) | C |
| (6) | C | (57) | C |
| (7) | C | (58) | C |
| (8) | D | (59) | D |
| (9) | A | (60) | A |
| (10) | C | (61) | C |
| (11) | C | (62) | A |
| (12) | A | (63) | B |
| (13) | B | (64) | D |
| (14) | D | (65) | A |
| (15) | D | (66) | X B |
| (16) | A | (67) | C |
| (17) | C | (68) | C |
| (18) | D | (69) | B <i>or A</i> |
| (19) | C | (70) | D |
| (20) | B | (71) | D |
| (21) | D | (72) | A |
| (22) | C | (73) | C |
| (23) | B | (74) | X D |
| (24) | D | (75) | B |
| (25) | A | (76) | D |
| (26) | B | (77) | C |
| (27) | A | (78) | C |
| (28) | C | (79) | D |
| (29) | B | (80) | D |
| (30) | B | (81) | C |
| (31) | D | (82) | B |
| (32) | B | (83) | C |
| (33) | D | (84) | B |
| (34) | A | (85) | D |
| (35) | C | (86) | C |
| (36) | B | (87) | A |
| (37) | C | (88) | C |
| (38) | B | (89) | D |
| (39) | D | (90) | A |
| (40) | C | (91) | A |
| (41) | C | (92) | D |
| (42) | B | (93) | C |
| (43) | A | (94) | B |
| (44) | B | (95) | C |
| (45) | C | (96) | A |
| (46) | B | (97) | D |
| (47) | B | (98) | A |
| (48) | D | (99) | D |
| (49) | B | (100) | A |
| (50) | A | | |
| (51) | B | | |

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 1 1 Point

The following events occur:

- The plant is at full power.
- Rod Drive Clutches are being supplied from Instrument Buses A and C.
- Instrument Bus B is deenergized.
- The operator then inadvertently switches a clutch power supply from Instrument Bus A to Instrument Bus B.

Which one of the following describes the effect that this action will have on CEA position?

- a. No effect.
- b. The shutdown CEAs will drop.
- c. All CEAs will drop.
- d. RPS will generate a reactor trip on one channel.

QUESTION 2 1 Point

During a startup, the connection between the drive mechanism for a high worth Shutdown CEA and its poison fingers becomes uncoupled. As a result, the drive mechanism withdraws normally but all poison fingers associated with it remain fully inserted in the core. Which one of the following describes a symptom that the operators will see as a result of this event?

- a. The affected rod bottom light will remain on.
- b. The SCEAPIS will show no rod motion for that CEA.
- c. Criticality will occur below the PDIL.
- d. The ECP will predict criticality at a higher than actual CEA position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 3

1 Point

The following conditions exist:

- A reactor trip due to a loss of offsite power has occurred.
- An inadvertent SGIS occurred after the trip.
- MS-291 ('A' S/G relief) is open.
- MS-292 ('B' S/G relief) will not open.
- Pressurizer level is 50%.
- Subcooling Margin is 50°F.
- Present RCS Cooldown Rate is 100°F/hr.

Which one of the following describes the expected natural circulation patterns that will develop under these condition?

- a. No natural circulation will develop.
- b. It will develop in the A loop, the B loop will be stagnant.
- c. It will develop in the A loop, reflux boiling will develop in the B loop.
- d. It will develop in the 'A' loop but flow will occur in both loops.

QUESTION 4

1 Point

Which one of the following describes the automatic operation of PCV-1753 (Instrument Air/Service Air Cross Tie)?

- a. It closes if service air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- b. It closes if service air pressure decreases to 80 psig but must be reopened manually.
- c. It closes when instrument air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- d. It closes when instrument air pressure decreases to 80 psig but must be reopened manually.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 5

1 Point

The following conditions exist:

- A LOCA has occurred.
- All HPSI pumps are injecting.
- PPLS has been reset.
- Containment spray is in operation.
- Containment pressure is 6 psig.
- The current source of water is the containment sump.
- RAS has not been reset.

Resetting RAS under these conditions will result in which one of the following consequences?

- a. Potential damage to the lockout relays.
- b. It will be possible to start the LPSI pumps.
- c. The containment spray pumps will trip.
- d. The water source will swap back to the SIRWT.

QUESTION 6

1 Point

The heated junction thermocouples measure percent of level over which one of the following ranges?

- a. Top of the vessel (100%) to bottom of the vessel (0%).
- b. Top of the core (100%) to bottom of the core (0%).
- c. Top of the vessel (100%) to top of the core (0%).
- d. Top of the core (100%) to the bottom of the vessel (0%).

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 7

1 Point

The following post-trip conditions exist:

- RCS pressure=500 psia.
- Tc=410°F
- Th=440°F
- CET Average=445°F

Which one of the following actions is required concerning the RCPs?

- a. No action is required.
- b. Trip only one RCP.
- c. Trip one RCP in each loop.
- d. Trip all RCPs.

QUESTION 8

1 Point

The following conditions exist:

- The reactor has tripped as a result of a loss of offsite power.
- D1 and D2 have energized 1A3 and 1A4.
- Auxiliary Feed Pumps will not start.
- Steam Generator levels are currently 20% WR and slowly lowering.
- All other safety functions are met.

Which one of the following procedures should be implemented immediately after EOP-00?

- a. EOP-02.
- b. EOP-06.
- c. EOP-20/HR-2
- d. EOP-20/HR-4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 9

1 Point

During an entry into a Confined Space within the RCA, the Confined Space Entry Permit is maintained at which one of the following places?

- a. Confined Space Access Point.
- b. RCA Access Control Point.
- c. Shift Supervisor's Office.
- d. Industrial Safety Coordinator's Office.

QUESTION 10

1 Point

Following a CIAS, how can sampling of the containment sump be accomplished?

- a. Containment sump sample lines do not isolate on a CIAS.
- b. A manual bypass valve is provided to allow sampling of the containment sump following a CIAS.
- c. The isolation signal for the valves can be temporarily bypassed and the valves opened following a CIAS.
- d. No containment sump sample can be taken until the CIAS is reset.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 11

1 Point

Prior to placing a Gas Decay Tank in service, which one of the following conditions must be verified?

- a. Iodine-131 dose equivalent less than $1\mu\text{Ci/gm}$.
- b. Total activity less than $1\mu\text{Ci/gm}$.
- c. Oxygen concentration less than 3%.
- d. Nitrogen concentration greater than 20%.

QUESTION 12

1 Point

The plant is operating at full power when high radiation in the Auxiliary Building results in a VIAS. Which one of the following describes the response of the Spent Fuel Area Charcoal Filters (VA-66) to this event?

- a. They will not be affected.
- b. Their bypass damper (HCV-712A) will close and their isolation damper (HCV-712B) will open.
- c. Their bypass damper (HCV-712A) will close. Their isolation damper (HCV-712B) will not be affected.
- d. Their bypass damper (HCV-712A) will not be affected. Their isolation damper (HCV-712B) will open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 13 1 Point

Which one of the following is an indication of RCS void formation during a natural circulation cooldown?

- a. Pressurizer level lowers while operating auxiliary pressurizer spray.
- b. The RCS can not be depressurized to SDC entry conditions.
- c. RCS subcooling is 25°F.
- d. A rapid increase in indicated Reactor Vessel Level on QSPDS.

QUESTION 14 1 Point

The following sequence of events occurs:

- An SIAS starts all ECCS pumps.
- The diesels are running normally.
- Offsite power is lost.
- None of the RCP breakers open on Load Shed.

Which one of the following describes the effect that these events will have on the restart of the ECCS pumps as a result of load sequencer operation?

- a. All ECCS pumps will restart normally.
- b. Only the HPSI pumps will restart.
- c. All except the HPSI pumps will restart.
- d. No ECCS pumps will restart.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 15

1 Point

The following plant conditions exist:

- The reactor is in Mode 4.
- The pressurizer manway is in place.
- Shutdown Cooling is in service.
- Shutdown Cooling Isolation Valves (HC-347/348) then go fully closed.

Which one of the following is the most likely cause of these events?

- a. Pressurizer pressure channel P-115 has failed low.
- b. Pressurizer pressure channel P-118 has failed low.
- c. Power has been lost to pressurizer pressure channel P-115.
- d. Power has been lost to pressurizer pressure channel P-118.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 16

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- The Tave signal from Channel A RRS to the Pressurizer level control system fails upscale.
- The operator immediately takes the A/B switch on panel CB-4 to B.
- The Pressurizer level channel selector switch is selected to X.

Which one of the following is the expected consequence of these events?

- a. Actual and indicated pressurizer level will be unaffected.
- b. Indicated pressurizer level will decrease, actual level will be unaffected.
- c. Actual pressurizer level will decrease.
- d. Actual pressurizer level will increase.

QUESTION 17

1 Point

Under which one of the following conditions will the Subcooled Margin Monitors on CB-4 provide invalid results?

- a. With Containment Pressure greater than 5 psig.
- b. With Pressurizer Pressure below 1700 psia.
- c. With RCS Coolant Temperatures below 465°F
- d. With Containment Temperature above 180°F.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 18

1 Point

The following conditions exist:

- River temperature is 55°F.
- The plant is operating at full power.
- Raw Water Pump AC-10A has been inop for the past 3 days.
- Containment Spray Pump SI-3B has just been declared inop.

In order to satisfy the requirements of Tech Specs, these conditions require that the plant be taken to HOT SHUTDOWN within which one of the following times?

- a. The plant should already be in HOT SHUTDOWN.
- b. 36 hours.
- c. 4½ Days.
- d. 7½ days.

QUESTION 19

1 Point

The following conditions exist:

- The plant is in Cold Shutdown for a refueling outage.
- The containment purge system is operating in the low purge rate mode with fan VA-77.
- A high alarm occurs on radiation monitor RM-062 [stack gas monitor].

Which one of the following describes the expected response of the containment purge system to these events?

- a. The inboard containment isolation valves only would close and the low purge rate fan would trip.
- b. The outboard containment isolation valves only would close and the low purge rate fan would trip.
- c. Both the inboard and the outboard isolation valves would close and the low purge fan would trip.
- d. No automatic action would occur.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 20

1 Point

The MSIVs are open when power is lost on DC bus #2. Which one of the following describes the effect that this event will have on the MSIVs?

- a. An SGLS A will be generated and both MSIVs will close.
- b. An SGLS B will be generated and both MSIVs will close.
- c. An SGLS B will be generated and MSIV 1042A will close.
- d. An SGLS B will be generated but neither MSIV will close.

QUESTION 21

1 Point

The following conditions exist:

- The plant is at 100% power.
- All major breakers are in their normal lineup.
- The electrical distribution system is aligned for automatic operation.
- The control switch for breaker 1A11 is then turned to the open (green flag) position.

Which one of the following will occur as a result of these conditions?

- a. Breaker 1A11 will not open unless breaker 1A31 is closed first.
- b. A fast transfer will occur with breaker 1A31 closing before breaker 1A11 opens.
- c. A fast transfer will occur with breaker 1A11 opening before breaker 1A31 closes.
- d. Breaker 1A11 will open but breaker 1A31 will not close.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 22 1 Point

Diesel generator D1 has received a start signal as a result of a reactor trip. The engine lube oil pump discharge pressure switch has failed in the low pressure position. Which one of the following describes the expected response of D1 to these events?

- a. It will not start.
- b. It will start but will trip after 15 seconds.
- c. It will start and then idle at 500 rpm.
- d. It will start and then run at 900 rpm.

QUESTION 23 1 Point

With the plant operating at full power, which one of the following diesel generator operability histories is in compliance with the requirements of Tech Spec 2.7 2(j)?

- a. DG-1 is inop from 4/26 to 5/4
- b. DG-2 is inop from 4/24 to 4/30 and from 5/2 to 5/5
- c. DG-1 is inop from 4/20 to 4/25 and DG-2 is inop from 4/26 to 4/30.
- d. DG-1 is inop from 4/25 to 4/30 and DG-2 is inop from 4/28 to 5/2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 24

1 Point

Which one of the following conditions will cause the Control Room Ventilation System to automatically switch to the Filtered Air makeup mode of operation?

- a. High inlet Chlorine.
- b. Smoke detected in control room exhaust.
- c. High Iodine activity detected by RM-065.
- d. Containment Radiation High Signal (CRHS) actuation

QUESTION 25

1 Point

The following conditions exist:

- RCS temperature is being maintained on Shutdown Cooling.
- All controls are in auto.
- The operator takes action to decrease RCS temperature.

Which one of the following describes the response of Shutdown Cooling Valves HCV-341 and FCV-326 to this action?

- a. HCV-341 throttles open, FCV-326 throttles closed.
- b. HCV-341 throttles closed, FCV-326 throttles open.
- c. Both valves throttle closed.
- d. Both valves throttle open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 26

1 Point

With the reactor at power, which one of the following is the most reliable indication that a Pressurizer PORV is leaking?

- a. PORV position indicator.
- b. Tail pipe temperature.
- c. Quench tank pressure.
- d. Quench tank temperature.

QUESTION 27

1 Point

At which one of the following containment hydrogen concentrations is initiation of Hydrogen Purge required?

- a. 3%
- b. 5%
- c. 7%
- d. 9%

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 28

1 Point

If the turbine has failed to trip following a reactor trip, which one of the following explains why the contingency action of tripping the EHC pumps is preferred over closing the MSIVs and MSIV bypass valves?

- a. To prevent a possible Turbine overspeed.
- b. To retain the use of MS-291 and MS-292.
- c. To retain the use of the atmospheric and condenser steam dump valves.
- d. To minimize RCS cooldown.

QUESTION 29

1 Point

The following conditions exist:

- Raw Water pumps AC-10A & 10B are running.
- Raw Water pumps AC-10C & 10D are in standby.
- Pump AC-10A trips on an overload fault.

Which one of the following lists the Raw Water pumps expected to be running after this event?

- a. 10C & 10D
- b. 10B & 10D
- c. 10D only
- d. 10B only

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 30

1 Point

Section IV of AOP-23, (Reset of Containment Isolation Actuation Signal (CIAS) and Reset of Ventilation Isolation Actuation Signal (VIAS)), step 4; directs the operator to ensure the Hand Controller thumbwheels for any open HCV-400'C' series CCW valve are set fully counter-clockwise. Which one of the following describes why this direction is necessary?

- a. Ensures adequate CCW flow to the Containment Cooling coils when CIAS is actuated.
- b. Ensures that CCW relief valves do not lift during resetting of CIAS lockouts.
- c. Ensures adequate CCW flow to the Containment Cooling coils when VIAS is actuated.
- d. Ensures that CCW relief valves do not lift during resetting of VIAS lockouts.

QUESTION 31

1 Point

A reactor trip has occurred but one CEA failed to insert because its clutch failed to disengage. Which one of the following will prevent the affected CEA from driving to its LEL in response to a Rod Shutdown (RRD)?

- a. Loss of power to the 400 Hz inverter.
- b. Drive Mode Selector Switch in either of the auto positions (AS, AG).
- c. Drive Mode Selector Switch in any of the manual positions (MS, MG, MI).
- d. Drive Mode Selector Switch in the OFF position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 32 1 Point

The following plant conditions exist:

- The plant is at 75% power.
- All CEAs are out.
- Boron Concentration is 650 ppm
- Core age is 10,000 MWD/T

Reactor power is to be increased to 100%. Neglecting the effects of xenon, which one of the following is closest to the boron concentration at 100% power?

- a. 550 ppm
- b. 610 ppm
- c. 630 ppm
- d. 690 ppm

QUESTION 33 1 Point

Which one of the following describes the expected response of the CCW Heat Exchanger Bypass Valve (HCV-497) to an SIAS?

- a. Goes fully open.
- b. Goes fully closed.
- c. Closes to minimum flow (15% open).
- d. Does not change position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 34

1 Point

The plant is operating at full power when Pressurizer Pressure Sigma Meter (A/P-102) fails high. Which one of the following is the expected consequence of this event?

- a. PPLS logic becomes 2/3, otherwise no actions occur.
- b. PPLS will automatically block.
- c. Backup heaters energize, pressure increases, spray valves open, and pressure stabilizes at a higher value.
- d. Backup heaters deenergize, pressure decreases, proportional heaters energize, and pressure stabilizes at a lower value.

QUESTION 35

1 Point

EOP-05 (Uncontrolled Heat Extraction) directs the operators to terminate Containment Spray as soon as containment pressure decreases below 3 psig. Which one of the following is the basis for minimizing the amount of spray following a steam line break?

- a. Minimize depletion of Tri-Sodium Phosphate.
- b. Reduce the possibility of Pressurized Thermal Shock.
- c. Minimize the amount of hydrogen generation.
- d. Allow the start of the containment cooling system.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 36

1 Point

The following conditions exist:

- A steam leak has occurred in Room 19.
- The leak was isolated after 30 minutes.
- The leak was upstream of the AFW steam supply check valve.
- The leak was isolated by closing YCV-1045B and its warmup valves.

The operability of which one of the following components is LEAST likely to be affected by these events?

- a. FW-6.
- b. FW-10.
- c. The control room start air compressor.
- d. The standby air compressor.

QUESTION 37

1 Point

A site blackout has occurred and DC loads have been minimized in accordance with EOP-07. Which one of the following specifies the amount of time that the control room instrumentation may be relied upon under these conditions?

- a. 1 hour
- b. 4 hours
- c. 8 hours
- d. 12 hours

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 38

1 Point

With a normal electrical system lineup, which one of the following describes how Instrument Bus 'C' would be powered following failure of its Inverter?

- a. Power would be lost until manually restored.
- b. The supply would automatically switch to the bypass transformer for inverter C.
- c. The Cross Tie breakers between instrument buses A and C would automatically close to supply instrument bus C.
- d. The Cross Tie breakers between instrument buses 1 and C would automatically close to supply instrument bus C.

QUESTION 39

1 Point

Which one of the following describes the expected response of the Fire Protection System to a fire in the East Switchgear Room?

- a. The first detector actuated causes the ventilation dampers to the affected space to shut. After a 60 second time delay, the halon bank discharge is initiated.
- b. After two detectors have actuated in the same space, the ventilation dampers for both switchgear rooms shut and the halon bank discharge is initiated.
- c. The first detector actuated causes the ventilation dampers in both switchgear rooms to shut. The second detector actuated causes the halon bank to discharge.
- d. After two detectors have actuated in the same space, the ventilation dampers in both switchgear rooms shut. After a 60 second time delay, the halon bank discharge is initiated.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 40

1 Point

The following conditions exist:

- The control room has been evacuated.
- A plant cooldown must be conducted from the Alternate Shutdown Panel.

Which one of the following describes the actions necessary to avoid PPLS during this cooldown?

- a. PPLS must be blocked as part of the process of evacuating the control room.
- b. PPLS will not auto initiate with control at the Alternate Shutdown Panel.
- c. All affected equipment must be placed in Pull-to-Lock locally at their breaker panels.
- d. The control power fuses of all affected equipment are removed from their breakers cabinets.

QUESTION 41

1 Point

With the plant at power and no evolutions in progress, which one of the following conditions requires entry into AOP-12 (Loss of Containment Integrity)?

- a. HCV-746A (Pressure Relief) is opened.
- b. One of the Personnel Air Lock doors is open.
- c. An unexpected decrease in containment pressure has occurred.
- d. A containment isolation MOV is inoperable but is locked closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 42

1 Point

EOP-06 (Loss of All Feedwater) directs the operators to trip all RCPs. Which one of the following describes the basis for this action?

- a. Flow from the RCPs would interfere with bleed and feed cooling.
- b. Eliminate the RCPs as a source of heat input to the RCS.
- c. Reduce the risk of clad damage due to quenching if a void forms in the vessel.
- d. Allow the stratification of phases so that liquid water remains in the low point (i.e. reactor vessel).

QUESTION 43

1 Point

If E-Bar is 3.301, which one of the following is the highest RCS activity allowed by technical specifications)?

- a. 30.2 $\mu\text{Ci/gm}$.
- b. 38.1 $\mu\text{Ci/gm}$.
- c. 42.1 $\mu\text{Ci/gm}$.
- d. 48.2 $\mu\text{Ci/gm}$.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 44

1 Point

The following conditions exist:

- No operator actions have been taken.
- Core life is near EOL.
- Power level is 80% and increasing.
- Pressurizer level is following its program level.
- T_{ave} is increasing.
- Containment pressure and temperature are normal.
- Pressurizer pressure is normal.
- All systems are in their normal mode.

Which one of the following is the most likely cause of these conditions?

- a. Partial loss of feedwater heating.
- b. Continuous rod withdrawal.
- c. Steam leak outside containment.
- d. Closure of 1 MSIV.

QUESTION 45

1 Point

Which one of the following is the expected response of nuclear power to a dropped CEA?

- a. The effect on power will be negligible but axial peaking factors will increase.
- b. Power will drop approximately 5% (depending on the worth of the CEA) and remain there. Peaking factors will be unaffected.
- c. Power will drop and then return to near the predrop level. Radial peaking factors will increase.
- d. Power will drop and then return to near the predrop level. The Dropped Rod light on the drawer will be extinguished.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 46

1 Point

Which one of the following describes why it is important for the turbine to trip on a reactor trip?

- a. To preserve steam generator inventory.
- b. To prevent excessive cooldown of the RCS.
- c. To prevent turbine damage due to a loss of load overspeed.
- d. To prevent generator damage due to reverse current.

QUESTION 47

1 Point

The following conditions exist:

- The plant is operating at 100% power.
- Quench tank pressure is being maintained at 7 psig.
- The source of the Quench Tank pressure is that Pressurizer Safety Valve (RC-142) is leaking.

Which one of the following is the temperature expected to be seen on Tailpipe Temperature monitor TIA-136?

- a. 150°F
- b. 230°F
- c. 300°F
- d. 640°F

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 48

1 Point

Which one of the following parameters is the most effective in discriminating between a Small Break LOCA and a Steam Line Break Inside Containment?

- a. Containment Pressure
- b. RCS Pressure
- c. Containment Temperature
- d. Steam Generator Pressure

QUESTION 49

1 Point

The following conditions exist:

- A Large Break LOCA has occurred.
- All safeguards components are operating as required.
- The LO on the primary has announced that he has received LO-LO level alarms on both concentrated boric acid tanks.
- SIAS actuated 26 minutes ago.
- SIRWT level is 52 inches,

Which one of the following actions should be taken at this time?

- a. Place two charging pumps in pull stop, open LCV-218-2, close LCV-218-3, close HCV's-265, 268 and 258.
- b. Place all charging pumps in pull stop, close HCV-238, 239, 240, and 249, open HCV-247, 248 and 308.
- c. Close HCV's-265, 258, and 268, open HCV-308 or HCV-2988
- d. Continue Emergency Boration for an additional 4 minutes or until charging pumps lose suction.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 50

1 Point

In a recent plant modification, valve (HCV-438C) CCW Containment Isolation Valve was physically reversed. Which one of the following describes the reason that this modification was necessary?

- a. Eliminate the need to cooldown and depressurize in order to isolate a leaking RCP seal cooler.
- b. To facilitate the replacement of CRDM seals.
- c. The valve was initially installed incorrectly.
- d. To reduce the possibility of waterhammer in the CCW system on CIAS.

QUESTION 51

1 Point

The following conditions exist:

- The plant on Shutdown Cooling.
- The 'A' Shutdown Cooling Heat Exchanger is not available.
- Shutdown cooling is provided through the 'B' Shutdown Cooling Heat Exchanger.
- The plant has been shutdown for 10 days.
- RCS temperature is 120°F.
- The refueling cavity is flooded.
- Containment integrity is not set.
- Cooling water is lost to the operating shutdown cooling heat exchanger.

Which one of following states the amount of time before which containment integrity must be reset.

- a. 8 hours
- b. 15 hours
- c. 24 hours
- d. 48 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 52

1 Point

The reactor is critical at $10^{-4}\%$ power when an inadvertent Emergency Boration Occurs. RCS boron concentration is raised by 10 ppm before it is stopped. Which one of the following describes the effect that this event will have on T_c ?

- a. It will decrease the most at BOL.
- b. It will decrease the most at EOL.
- c. It will decrease the same at EOL as at BOL.
- d. It will not be significantly affected.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 53

1 Point

The plant is at $1 \times 10^{-1}\%$ with a shutdown in progress. As power decreases which one of the following would provide positive Control Room indication that the Wide Range Nuclear Instrumentation System was in the 'Extended Range'?

- a. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- b. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.
- c. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- d. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 54

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- CCW to Detector Well Cooling Containment Isolation valve HCV-467B fails closed.

Which one of the following describes the effect that this will have?

- a. Wide range nuclear instrumentation will swap to extended range.
- b. Primary Rod Position Indication must be declared inoperable.
- c. Variable Overpower Trip (VOPT) pretrip.
- d. The Detector Well Cooling Fans will trip.

QUESTION 55

1 Point

Which one of the following describes the basis for the Technical Specification limits on RCS activity?

- a. To limit Aux building dose rates resulting from a loss of coolant accident.
- b. To limit Aux building dose rates resulting from a fuel handling accident.
- c. To limit offsite doses resulting from a steam generator tube rupture accident.
- d. To limit offsite doses resulting from a loss of feedwater accident.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 56

1 Point

Initiation of LTOP is described in the Floating Step; Blocking of PPLS. Which one of the following states when the LTOP mode of the PORV is enabled?

- a. Whenever the PORV switches are in the AUTO position.
- b. Automatically, whenever pressurizer pressure drops below 1600 psia.
- c. When PPLS is blocked by the Operator.
- d. When RCS temperature is less than 320°F

QUESTION 57

1 Point

The following conditions exist:

- All offsite power has been lost.
- The reactor has tripped.
- EDG #1 did not start and 1A3 is not energized.
- #1 DC bus is deenergized due to a dead short.
- The reason for the EDG failure to start has been corrected.

Which one of the following must be accomplished before the #1 Diesel can be started and loaded?

- a. Start the diesel locally, at AI-133.
- b. Place the diesel back in AUTO.
- c. Transfer DC Control Power to its alternate source.
- d. Start the diesel manually, remotely.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 58

1 Point

The plant is in Mode 1 when the EONA reports that the area monitor in corridor 4 is in alarm and reads 200 mRem/hr. Which one of the following AOPs should be entered as a result of this condition?

- a. None
- b. AOP-08 (Fuel Handling Incident)
- c. AOP-09 (High Radioactivity)
- d. AOP-21 (RCS High Activity)

QUESTION 59

1 Point

The following conditions exist:

- The plant is operating at full power.
- Stack radiation is increasing from the controlled access area of the auxiliary building.
- VCT level is lowering.

Which one of the following compartments is the most likely source of the radioactivity?

- a. Room 21
- b. Corridor 26
- c. The spent fuel storage pool
- d. The letdown heat exchanger room

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 60

1 Point

Which one of the following describes the relationship between plant conditions and indicated vs. actual pressurizer level?

- a. A steam leak in containment will cause indicated level to be higher than actual.
- b. A steam leak in containment will cause indicated level to be lower than actual.
- c. A Steam Generator Tube Rupture will cause indicated level to be higher than actual.
- d. A Steam Generator Tube Rupture will cause indicated level to be lower than actual.

QUESTION 61

1 Point

The following conditions exist:

- Fuel handling operations are in progress.
 - Personnel are working both in Containment and the Aux Building.
 - An Aux Building stack monitor alarms.
 - This initiates VIAS.
 - Area Monitor (RM-087) Spent Fuel Pool Wall alarms. Which one of the following actions should be taken?
- a. Reset and restart containment cooling.
 - b. Verify containment integrity is set.
 - c. Evacuate the Aux Building.
 - d. Trip all Aux Building Exhaust Fans.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 62

1 Point

Following a loss of offsite power pressurizer level is to be maintained above 45%. Which one of the following is the reason that this is necessary?

- a. Assure continued heater operation to preserve subcooling.
- b. Assure adequate pressurizer level for RCP start when power is restored.
- c. Assure adequate RCS inventory during any subsequent cooldown.
- d. Assure adequate inventory for reflux boiling if loss of power is prolonged.

QUESTION 63

1 Point

Which one of the following events would require the immediate termination of any Waste Gas Release in progress?

- a. Containment area monitor alarm.
- b. Stack radiation monitor alarm.
- c. Failure of a containment gas monitor.
- d. Failure of the waste gas flow rate recorder.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 64

1 Point

In the course of conducting a Valve Alignment Verification Checklist, the operator discovers that a particular valve is not in the position called for in the checklist. Which one of the following actions should be taken concerning this valve?

- a. Reposition the valve to the position specified in the checklist.
- b. Place a Caution Tag on the valve.
- c. Inform the Security Shift Supervisor and request an investigation.
- d. Contact the control room for further instructions.

QUESTION 65

1 Point

FW-2B has been tagged out of service for both mechanical and electrical work using a group tagout. The Electrical Group Foreman has requested a temporary clearance to perform some testing on the motor. In addition to the Shift Supervisor, who must approve this temporary clearance?

- a. All persons listed on Attachment 1 to the Group Tagout Sheet.
- b. All persons involved in the testing of the motor.
- c. The maintenance planners involved with both the electrical and the mechanical work.
- d. The Duty Supervisor.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 66

1 Point

The RWP Surveillance and ALARA coordinator has determined that an ALARA job briefing is required for performance of a job in the RCA. Which one of the following restrictions apply until all affected workers attend an ALARA Job Briefing?

- a. TLDs may not be issued to affected workers.
- b. Workers may not sign the RWP.
- c. Workers may not enter the protected area.
- d. The Work Order may not be approved.

QUESTION 67

1 Point

Under which one of the following circumstances may a non-licensed member of the Plant Review Committee (PRC) enter the control room without receiving permission from the Shift Supervisor, LSO, or Licensed Operator?

- a. At any time.
- b. During Shift Turnover.
- c. Under Emergency Conditions.
- d. During a plant outage.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 68

1 Point

Which one of the following jobs require the use of a Ground Fault Circuit Interrupter (GFIC)?

- a. Rescue of an injured worker from a live electrical circuit.
- b. Replacing light bulbs in indoor light fixtures.
- c. Using a portable grinder on a piece of stainless steel near the SIRWT.
- d. Working on a de-energized electrical bus.

QUESTION 69

1 Point

In the event of a total loss of feedwater following a reactor trip on low steam generator level from full power, which one of the following specifies the minimum expected time that steam generator inventory can be relied upon to provide a heat sink?

- a. 10 minutes
- b. 20 minutes
- c. 40 minutes
- d. 60 minutes

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 70

1 Point

In responding to an oil spill and fire within the RCA, which one of the following serves as the Incident Commander?

- a. Any Radiation Protection Tech trained in fire fighting.
- b. The Plant Industrial Safety Coordinator.
- c. The Shift SRO.
- d. A Shift RO.

QUESTION 71

1 Point

Which one of the following CANNOT be used to determine the current revision of a procedure?

- a. Check with Document Control.
- b. Use the On-line CHAMPS index.
- c. Check an official copy at locations listed in SO-G-7.
- d. Check Attachment 1 to SO-G-7.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 72

1 Point

Which one of the following conditions requires that EOP-00 be referenced but NOT entered?

- a. RPS actuation following a manual reactor shutdown with T_c at 520°F.
- b. A reactor trip from 1% power with the generator off-line.
- c. A manual reactor trip from full power.
- d. RPS actuation while on shutdown cooling with T_c at 260°F.

QUESTION 73

1 Point

When using the Gaitronics System, which one of the following channels is reserved for operations department use?

- a. Line 1
- b. Line 2
- c. Line 3
- d. Line 4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 74

1 Point

Following a CIAS, a containment isolation valve which should have closed is stuck in the open position. How will this condition be indicated on the appropriate ERF Computer display page?

- a. The screen symbol for the valve will be green and steady.
- b. The screen symbol for the valve will be green and flashing.
- c. The screen symbol for the valve will be red and steady.
- d. The screen symbol for the valve will be red and flashing.

QUESTION 75

1 Point

An RO initiated a containment vent but did not remember to log it for several hours. Which one of the following is the correct way for this entry to be made?

- a. Insert the entry such that the sequence of events on the page is correct.
- b. Make a normal log entry marking it as a late entry in the time column.
- c. Make a normal log entry and then draw a line to the page location where it should have been entered initially.
- d. No action is required. Containment vents do not need to be logged.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 76

1 Point

Which one of the following describes the effect of a dropped rod on DNBR over the hour following the event? (Assume no operator action is taken.)

- a. DNBR improves immediately and then remains constant over the hour due to the decrease in power level.
- b. DNBR improves immediately due to power decrease and then deteriorates over the hour due to the effects of xenon.
- c. DNBR gets worse immediately due to flux distribution and then improves over the hour due to the effects of fuel temperature.
- d. DNBR gets worse immediately due to flux distribution and then gets worse over the hour due to the effects of xenon.

QUESTION 77

1 Point

During a LOCA, the EOPs may direct that all RCPs be secured. Which one of the following is the basis for taking this action?

- a. To retard the rate of RCS depressurization.
- b. To prevent possible pump damage from running under voided conditions.
- c. To allow stratification of phases thereby reducing rate of inventory loss.
- d. To remove the RCPs as a source of heat input to the RCS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 78

1 Point

Which one of the following conditions would indicate that natural circulation cooling may be losing its effectiveness?

- a. Cold leg temperature is 25°F lower than hot leg temperature.
- b. Cold leg temperature is 25°F lower than core exit thermocouple temperature.
- c. Hot leg temperature is 25°F lower than core exit thermocouple temperature.
- d. Hot leg temperature is 25°F lower than pressurizer temperature.

QUESTION 79

1 Point

The following plant conditions exist:

- A station blackout has occurred.
- The diesel engines have both failed to start.
- Natural circulation cooling has been established.

Assuming no change in conditions, which one of the following courses of action should be taken by the operators?

- a. Cooldown at the maximum rate possible to the point at which shutdown cooling entry conditions are satisfied.
- b. Cooldown at 100°F/hr until shutdown cooling entry conditions are met.
- c. Establish once through cooling.
- d. Maintain RCS at or near no load temperature until some electrical power is restored.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 80

1 Point

The following conditions exist:

- A Loss of All Feedwater occurred.
- A large void has formed in the reactor vessel.
- Feedwater was then restored.

Which one of the following describes the effect of starting the RCPs under these conditions?

- a. Pressurizer pressure and level will not change.
- b. Pressurizer pressure and level will raise.
- c. Pressurizer pressure increase and level will lower.
- d. Pressurizer pressure and level will lower.

QUESTION 81

1 Point

Which one of the following is the basis for the 2 of 4 SUR trip provided by the Nuclear Instrumentation System (NIS)?

- a. It provides protection against an uncontrolled dilution during startup at EOL.
- b. It provides protection against a large steam break accident during startup when steam generator inventory is the greatest at BOL.
- c. It limits power overshoot prior to VOPT actuation on a continuous rod withdrawal during startup.
- d. It limits power overshoot prior to VOPT actuation from a ruptured steam generator during startup.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 82

1 Point

Upon a gradual loss of instrument air pressure, at which one of the following pressures must the reactor be manually tripped?

- a. 40 psig.
- b. 50 psig.
- c. 60 psig.
- d. 70 psig.

QUESTION 83

1 Point

Which one of the following conditions would prevent the steam generator 2A feedwater regulating valve (FCV-1101) rundown following a reactor/turbine trip?

- a. Instrument air header pressure decreases to 90 psig.
- b. The Spec-200 controller for FCV-1101 has been placed in AUTO.
- c. The steam dump valve Auto/Inhibit switch has been placed in INHIBIT.
- d. Steam Generator '2A' downcomer level is low.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 84

1 Point

During a refueling outage, prior to draining the steam generators, jumpers are placed on the interposing relays on all four RPS channels. Which one of the following describes the effect that these jumpers have on RPS functions?

- a. Steam generator low downcomer level reactor trip is disabled. All other trips function normally.
- b. All reactor trips, except manual and diverse scram, are disabled.
- c. All reactor trips, except NIS generated trips, are disabled.
- d. None of the RPS generated reactor trips are affected.

QUESTION 85

1 Point

The following plant events occur:

- A plant heatup is in progress.
- Steam generator pressure is 400 psia.
- A large steam leak occurs in the turbine building.
- The MSIVs do not close.
- Both steam generators start to blow down uniformly.

Which one of the following describes the expected response of the AFW system to these events?

- a. Both AFW pumps will start when either steam generator level decreases to 32% WR.
- b. Only the motor driven AFW pump will start when either steam generator level decreases to 32% WR.
- c. Only the turbine driven AFW pump will start when both steam generator levels decrease to 32% WR.
- d. The AFW system will not respond to these events.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 86

1 Point

The power range instruments have been set in accordance with the most recent plant calorimetric heat balance calibration (XC-105). When the heat balance was performed, an error existed in the instrument used to measure feed flow. Actual feed flow was higher than measured feed flow. This will affect the degree of conservatism of the power range high power trip set point in which one of the following ways?

- a. It is unaffected.
- b. It becomes more conservative (trips at a lower power than required).
- c. It becomes less conservative (trips at a higher power than required).
- d. It depends upon flux shape and core life and cannot be predicted from this data.

QUESTION 87

1 Point

The following conditions exist:

- TCV-202 is closed.
- HCV-204 is open.
- PCV-210 is closed.

Which one of the following is the most likely cause of these conditions?

- a. High letdown temperature on TE-202.
- b. High letdown flow on FIC-212.
- c. High letdown pressure on PIC-210.
- d. Low letdown pressure on PIC-242.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 88

1 Point

The plant is operating at full power when the Extended Range Cutout Switch on Channel 'D' is inadvertently depressed. Which one of the following is a consequence of this event??

- a. There will be no effect on the nuclear instrumentation.
- b. Channel 'D' Power Range reading will decrease by approximately 10% power.
- c. Following the next shutdown, Channel 'D' will read significantly lower than the other channels.
- d. Following the next shutdown, Channel 'D' will read significantly higher than the other channels.

QUESTION 89

1 Point

The following conditions exist:

- A normal plant cooldown is in progress.
- The PPLS Block switches have been placed in the BLOCK position.
- RCS pressure is 1650 psia.
- Pressurizer pressure channel A/P-102 fails high.

Which one of the following will occur as a result of this sequence of events?

- a. Only the PPLS Block 'A' circuit would be automatically reset.
- b. Both PPLS circuits would be automatically reset but could be reblocked by operator action.
- c. Both PPLS circuits would be automatically reset and could not be reblocked.
- d. Both PPLS circuits would remain blocked.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 90

1 Point

AFAS has initiated AFW flow to both steam generators. The pressure in S/G RC-2A then falls to 100 psi less than the pressure in S/G RC-2B. Which one of the following describes the expected response of HCV-1107A and HCV-1107B to this event?

- a. Both will reclose.
- b. Both will reclose if their control switches are placed in the RESET position.
- c. HCV-1107A will reclose immediately, HCV-1107B will reclose if its control switch is placed in the RESET position.
- d. HCV-1107B will reclose immediately, HCV-1107A will reclose if its control switch is placed in the RESET position.

QUESTION 91

1 Point

The following conditions exist during an RCS cooldown:

- RCS pressure is 2000 psia.
- RCS temperature is 500°F.
- Pressurizer level is 50%.
- Two charging pumps are running.
- Four reactor coolant pumps are running.

Which one of the following actions must be taken to continue the cooldown?

- a. One reactor coolant pump must be tripped.
- b. Two reactor coolant pumps must be tripped.
- c. One charging pump must be tripped.
- d. An additional charging pump must be started.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 92

1 Point

The following conditions exist:

- A plant heatup is in progress.
- SGLS has been blocked.
- Steam generator pressure has risen to 650 psia.
- A malfunctioning steam dump then causes steam generator pressure to drop to 490 psia.

Which one of the following will occur as a result of these events?

- a. SGLS will not actuate and no other steam or feed system isolations will occur.
- b. SGLS will not actuate but the MSIVs will close on High Steam Flow.
- c. SGLS will actuate but only the MSIVs will close.
- d. SGLS will actuate and the MSIVs and Feedwater Isolation valves will close.

QUESTION 93

1 Point

A Loss of Offsite Power has occurred and the operators are conducting EOP-02 (Loss Of Offsite Power/Loss of Forced Circulation). As part of the plant depressurization they have installed Caution Tags on the HPSI Pump Switches in the Pull-To-Lock position. Which one of the following describes the reason it is necessary to remove the HPSI pumps from service at this time?

- a. Avoid HPSI pump damage due to inadequate NPSH.
- b. Avoid HPSI pump damage due to pump runout.
- c. Avoid RCS overpressurization due to inadvertent HPSI start.
- d. Avoid PORV damage due to passing cold water.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 94

1 Point

The following plant conditions exist:

- A plant startup is in progress.
- The plant is in MODE 2.
- Two Circ Water pumps are running.
- Steam dumps/Turbine bypass are controlling Tave.
- A maintenance error results in both running Circ Water pumps being stopped.

Which one of the following describes the expected response of the steam dumps and turbine bypass valves?

- a. Any open valves will close immediately.
- b. Any open valves will close when condenser vacuum degrades to 19 inches.
- c. The steam dumps will close immediately, the turbine bypass valve will close when condenser vacuum degrades to 19 inches.
- d. The turbine bypass valve will close immediately, the steam dumps will close when condenser vacuum degrades to 19 inches.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 95

1 Point

The following plant conditions exist:

- The plant is at 90% during an increase in power.
- A CEA in Control Group 4 is discovered to be at 50 inches.
- All other Group 4 CEAs are at 120 inches.
- Attempts to move the rod are unsuccessful.
- I&C investigates and reports that the drive motor for that rod has failed and will take 48 hours to repair.

Which one of the following actions is required as a result of these conditions?

- a. The power level increase and operations may continue without restriction.
- b. Power level must be maintained at or below 70% until the CEA is repaired.
- c. Power level must be maintained at or below 20% until the CEA is repaired.
- d. Verify shutdown margin and be in HOT SHUTDOWN within 5 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 96

1 Point

Four individuals received the following dose equivalents for the year.

Individual	A	B	C	D
Eff. Dose Equiv. (TEDE)	4R	1R	3R	2R
Total Organ Dose Equiv. (TODE)	30R	18R	15R	60R
Lens Dose Equivalent (LDE)	12R	18R	20R	10R

Which one of these individual's dose equivalent is within allowable limits per 10CFR20?

- a. A
- b. B
- c. C
- d. D

QUESTION 97

1 Point

The on-duty Shift Supervisor must be in the control room for which one of the following?

- a. During Diesel Generator Surveillance Tests.
- b. During Reactor Startup.
- c. Whenever the STA is absent from the control room.
- d. Whenever the LSO is absent from the control room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 98

1 Point

Use of the master annunciator silence feature in the control room may be directed by which one of the following?

- a. LSO or SS.
- b. An LO or LSO.
- c. STA or SS.
- d. Any licensed operator on shift.

QUESTION 99

1 Point

Which one of the following is a potential consequence of low hydrogen concentration in the VCT?

- a. Degraded performance of the CVCS demineralizers.
- b. Increased concentration of radioactive noble gases in the VCT.
- c. Increased chlorine concentration in the RCS.
- d. Increased oxygen concentration in the RCS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 100

1 Point

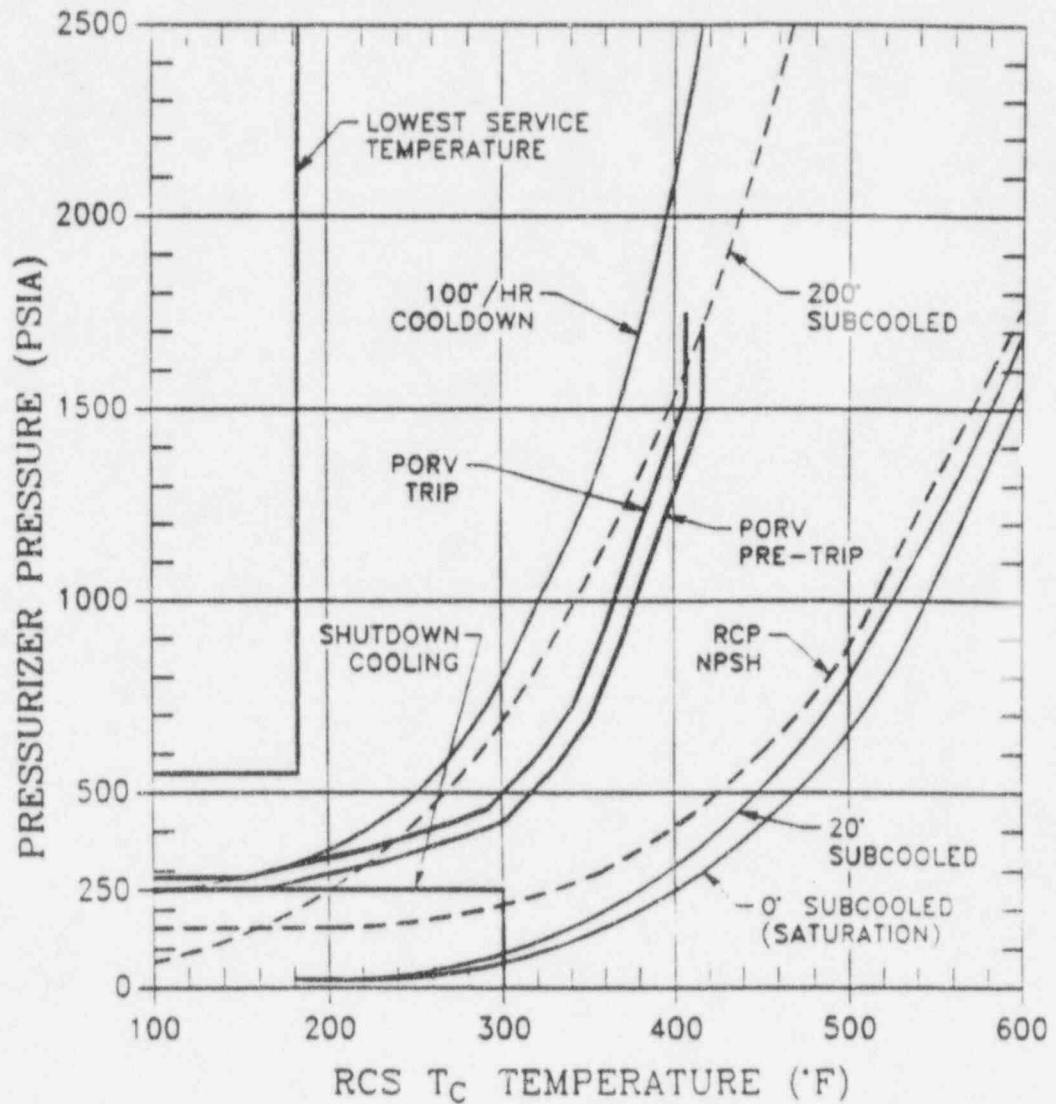
Upon declaration of an Emergency Action Level, who has the primary responsibility for dose assessment prior to activation of the TSC and EOF?

- a. Shift Chemist
- b. Shift RP Tech
- c. STA
- d. Dose assessment is not performed prior to TSC/EOF activation.

***** END OF EXAMINATION *****

Attachment 2

RCS Pressure-Temperature Limits



NOTES

1. This curve is only valid through 20 EFY.
2. 200°F subcooled curve supersedes 100°/HR cooldown curve anytime RCS has experienced an uncontrolled cooldown causing RCS temperature to go below 500°F.
3. To be the most conservative during forced circulation, T_h, or during natural circulation, CETs should be used for the 20°F subcooled and the saturation curve. T_c should be used for all other curves.

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 Containment Cooling

Applicability

Applies to the operating status of the containment cooling systems.

Objective

To assure operability of equipment required to remove heat from the containment during normal operating and emergency situations.

Specifications

(1) Minimum Requirements

- * a. The reactor shall not be made critical, except for low-temperature physics tests, unless all the following are met:
- ** 1. The following equipment normally associated with diesel-generator D1 (4.16-kV bus 1A3 and associated non-automatically transferring 480-Volt bus sections) is operable, except as noted:⁽¹⁾
- | | |
|--|--------|
| Raw water pump | AC-10A |
| Raw water pump | AC-10C |
| Component cooling water pump | AC-3A |
| Component cooling water pump | AC-3C |
| Containment spray pump | SI-3A |
| Containment air cooling and filtering unit | VA-3A |
| Containment air cooling unit | VA-7C |
- ** 11. The following equipment normally associated with diesel-generator D2 (4.16-kV 1A4 and associated non-automatically transferable 480 Volt bus sections) is operable, except as noted.⁽¹⁾
- | | |
|--|--------|
| Raw water pump | AC-10B |
| Raw water pump | AC-10D |
| Component cooling water pump | AC-3B |
| Containment spray pump | SI-3B |
| Containment air cooling and filtering unit | VA-3B |
| Containment air cooling unit | VA-7D |
| Containment spray pump | SI-3C |
- ** 111. All heat exchangers, valves, piping and interlocks associated with the above components and required to function during accident conditions are operable.
- ***

(1) Reactor may be made critical with one inoperable raw water pump. LCO action statements shall apply.

* SEE TSI-93-03

** SEE TSI-94-09

*** SEE TSI-95-09

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINMENT COOLING (Continued)

- b. During power operating one of the components listed in (1)a.1. and 11. may be inoperable. If the inoperable component is not restored to operability within seven days, the reactor shall be placed in hot shutdown condition within 12 hours. If the inoperable component is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.
- c. For cases involving Raw Water pump inoperability, if the river water temperature is below 60 degrees Fahrenheit, one Raw Water pump may be inoperable indefinitely without applying any LCO action statement. When the river water temperature is greater than 60 degrees Fahrenheit, an inoperable Raw Water pump shall be restored to operability within 7 days or the reactor shall be placed in a hot shutdown condition within 12 hours. If the inoperable Raw Water pump is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

(2) Modification of Minimum Requirements

During power operation, the minimum requirements may be modified to allow a total of two of the component listed in (1)a.1. and 11. to be inoperable at any one time (this does not include one Raw Water pump which may be inoperable as described above if the river water temperature is below 60 degrees Fahrenheit). Only two raw water pumps may be out of service during power operations. If the operability of one component is not restored within 24 hours, the reactor shall be placed in a hot shutdown condition within 12 hours. LCO 2.4(1)b. shall be applied if one of the inoperable components is restored within 24 hours. If the operability of both components is not restored within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

Any valves, interlocks and piping directly associated with one of the above components and required to function during accident conditions shall be deemed to be part of that component and shall meet the same requirements as for that component.

Any valve, interlock or piping associated with the containment cooling system which is not included in the above paragraph and which is required to function during accident conditions

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINER COOLING (CONTINUED)

may be inoperable for a period of no more than 24 hours.
If operability is not restored within 24 hours, the reactor
shall be placed in a hot shutdown condition within 12 hours.

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems

Applicability

Applies to the availability of electrical power for the operation of plant components.

Objective

To define those conditions of electrical power availability necessary to provide for safe reactor operation and the continuing availability of engineered safety features.

Specifications

(1) Minimum Requirements

The reactor shall not be heated up or maintained at temperatures above 300°F unless the following electrical systems are operable:

- a. Unit auxiliary power transformers TIA-1 or -2 (4,160 V).
- b. House service transformers TIA-3 and 4 (4,160 V).
- c. 4,160 V engineered safety feature buses 1A3 and 1A4.
- d. 4,160 V/480 V Transformers TIB-3A, TIB-3B, TIB-3C, TIB-4A, TIB-4B, TIB-4C.
- e. 480 V distribution buses 1B3A, 1B3A-4A, 1B4A, 1B3B, 1B3B-4B, 1B4B, 1B3C, 1B3C-4C, 1B4C.
- f. MCC No. 3A1, 3B1, 3A2, 3C1, 3C2, 4A1, 4A2, 4C1 and 4C2.
- g. 125 V d-c buses No. 1 and 2 (Panels EE-8F and EE-8G).
- h. 125 V d-c distribution panels AI-41A and AI-41B.
- i. 120V a-c instrument buses A, B, C, and D (Panels AI-40-A, B, C and D).
- * j. 120V a-c instrument panels AI-42A and AI-42B.
- k. Station batteries No. 1 and 2 (EE-8A and EE-8B) including one battery charger on each 125V d-c bus No. 1 and 2 (EE-8F and EE-8G).
- l. Two emergency diesel generators (DG-1 and DG-2).
- m. One diesel fuel storage system containing a minimum volume of 16,000 gallons of diesel fuel in FO-1, and an additional 8,000 gallons of diesel fuel in FO-10.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

(2) Modification of Minimum Requirements

The minimum requirements may be modified to the extent that one of the following conditions will be allowed after the reactor coolant has been heated above 300°F. However, the reactor shall not be made critical unless all minimum requirements are met. If any of the provisions of these exceptions are violated, the reactor shall be placed in a hot shutdown condition within the following 12 hours. If the violation is not corrected within an additional 12 hours, the reactor shall be placed in a cold shutdown condition within an additional 24 hours.

- a. Both unit auxiliary power transformers T1A-1 and -2 (4.16 kV) may be inoperable for up to 24 hours provided the operability of both diesel generators is demonstrated immediately.
- b. Either house service transformer T1A-3 or T1A-4 (4.16kV) may be inoperable for up to 7 days provided the operability of the diesel generator associated with the inoperable transformer is immediately verified. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 7 days is permissible, provided a special report is submitted to the NRC within 48 hours after transformer inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of transformer operability and the additional precautions to be taken while the transformer is out of service.
- c. Both house service transformers T1A-3 and T1A-4 (4.16kV) may be inoperable for up to 72 hours provided the operability of both diesel generators is immediately verified. The loss of the 161kV incoming line renders both transformers inoperable. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 72 hours is permissible, provided a special report is submitted to the NRC within 48 hours after both transformers' inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of the transformers' operability and the additional precautions to be taken while the transformers are out of service.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

- d. Either one of the 4.16kV engineered safeguards buses, 1A3 or 1A4 may be inoperable for up to 8 hours provided the operability of the diesel generator associated with the operable bus is demonstrated immediately and there are no inoperable required engineered safeguards components associated with the operable bus.
- e. One of each group of 4160 V/480 V Transformers (T1B-3A or 4A), (T1B-3B or 4B), and (T1B-3C or 4C) may be inoperable for up to 8 hours provided there are no inoperable required engineered safeguards components which are redundant to components on the inoperable transformer.
- f. One of the 480 V distribution buses connected to bus 1A3 or connected to bus 1A4 may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus.
- g. Either Group of MCC No.'s (3A1, 3B1, 3A2, 3C1, 3C2,) or (4A1, 4A2, 4C1, 4C2) may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable MCC. MCC 3C1 may be inoperable in excess of 8 hours if battery chargers No. 1 and No. 2 are operable.
- h. One of the four 120V a-c instrument buses (A, B, C or D) may be inoperable for 8 hours provided the reactor protective and engineered safeguards systems instrument channels supplied by the remaining three buses are all operable.
- i. Two battery chargers may be inoperable for up to 8 hours provided battery charger No. 1 (EE-8C) or No. 2 (EE-8D) is operable.
- *
**
*** j. Either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to seven days (total for both) during any month, provided there are no inoperable required engineered safeguards components associated with the operable diesel generator. If one diesel generator is inoperable, within 8 hours (regardless of when the inoperable diesel generator is restored to operability) EITHER:
- (1) Start the other diesel generator to verify operability, OR
- (2) Ensure the absence of common cause for the diesel generator inoperability for the other diesel generator.
- k. If inventory of diesel fuel in FO-1 is less than 16,000 gallons and/or FO-10 is less than 8,000 gallons, but the combined inventory in FO-1 and FO-10 is greater than a 6 day supply (21,350 gallons), then restore the required inventory within 48 hours.

* See TSI-92-13
** See TSI-94-06
*** See TSI-92-03

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems (Continued)

- l. Island buses 1B3A-4A, 1B3B-4B, and 1B3C-4C may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus(es).
- m. Either one of the 125V d-c buses No. 1 or 2 (Panels EE-8F or EE-8G) may be inoperable for up to 8 hours.
- n. Either one of the 125V d-c distribution panels AI-41A or AI-41B may be inoperable for up to 8 hours.
- o. Either one of the 120V a-c instrument panels AI-42A or AI-42B may be inoperable for up to 8 hours.

APPENDIX B
TECHNICAL SPECIFICATION INTERPRETATION

TSI- 92-13

TECHNICAL SPECIFICATION REFERENCE: 2.7
TECHNICAL SPECIFICATION PAGE NO.: 2-34
PARAGRAPH/TABLE/ITEM: 2.7(2)j.

INTERPRETATION:

Technical Specification states, "either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to 7 days (total for both) during any month,...." "During any month" is interpreted to mean during any calendar month. The 7 day LCO clock restarts with the beginning of a new month. This is not, however, to be construed as allowing any single diesel outage to exceed 7 days by overlapping outage time at the end of one month with the outage time allowed for a new month.

BASES:

Question was posed to NRC Project Manager, Wayne Walker, who conferred on this issue with NRC-NRR. The NRC is in agreement with this interpretation provided that the 7 day overall limit is not exceeded.

PRC RECOMMENDS
APPROVAL

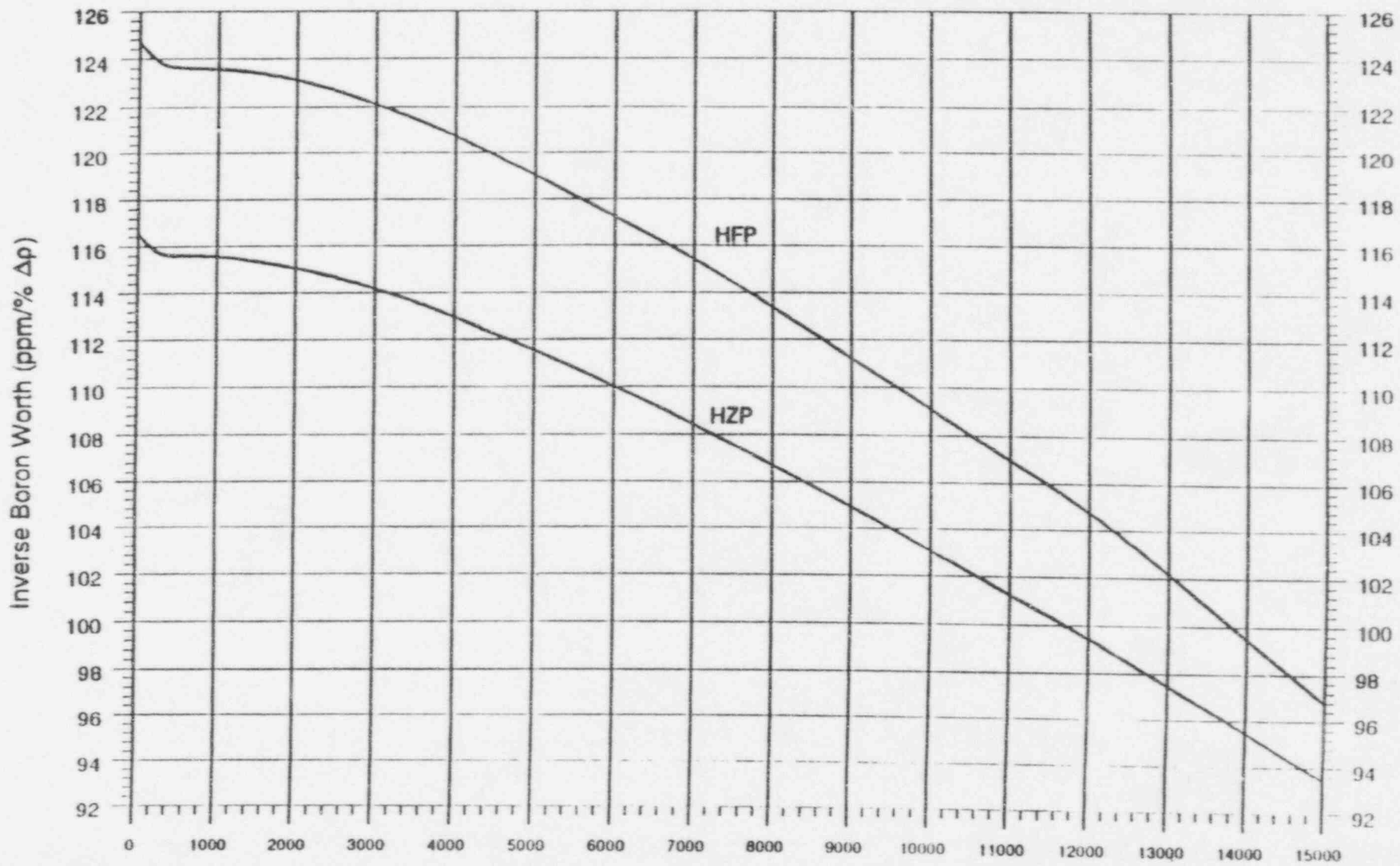
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PRC MTG. MINUTES

REFERENCES:

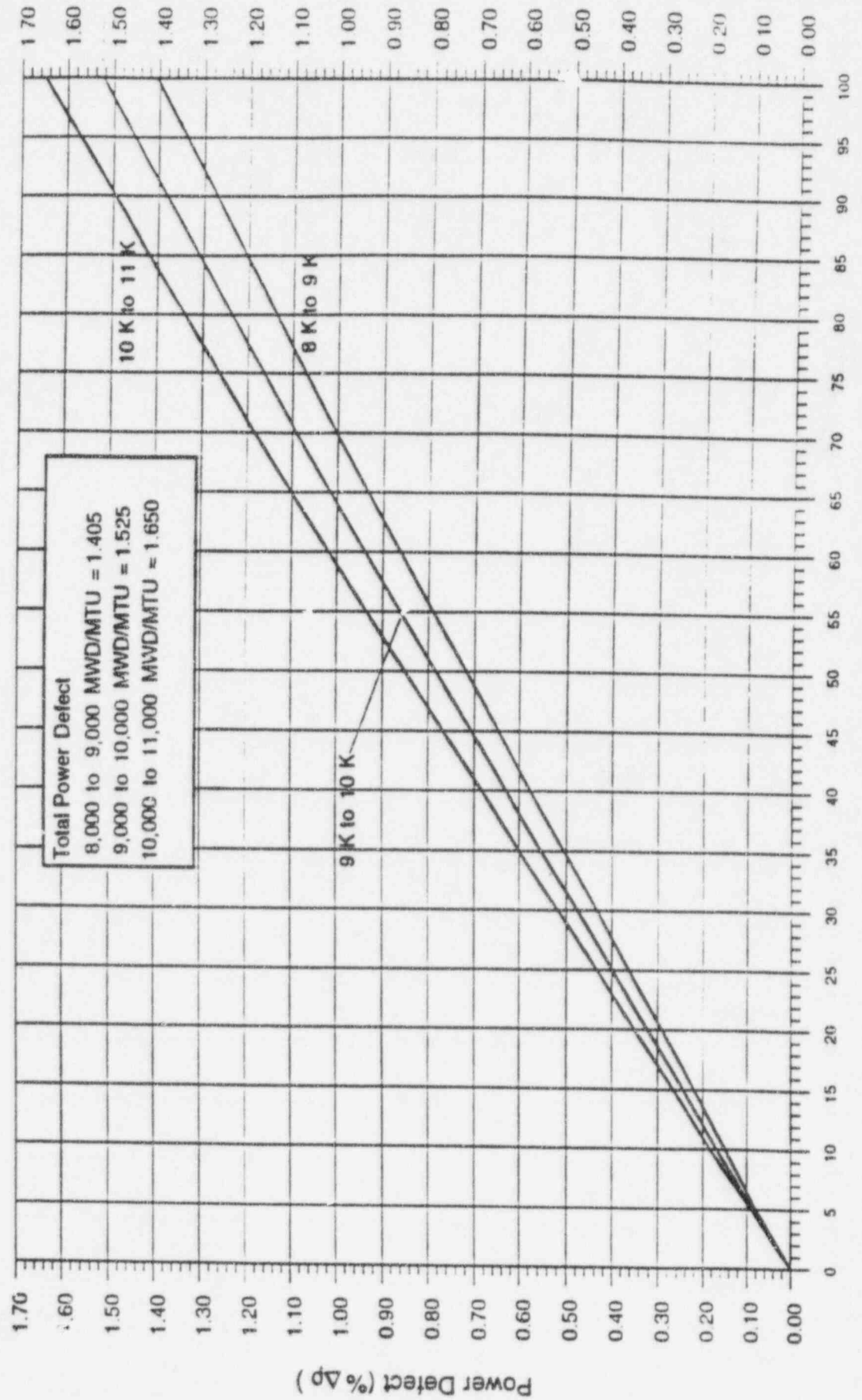
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6. CONCURRENCE: W Walker DATE: 10-1-92
Manager - NL&IA
7. APPROVED: J D Pait DATE: 10-15-92
Chairman - PRC

Figure II.A.4
Cycle 16 Inverse Boron Worth vs Burnup



R20

Figure II.C.2.b
Cycle 16 Total Power Defect vs Power
 (8,000 to 11,000 MWD/MTU)



Attachment B

Time to Boil Determination Worksheet

1. Time Shutdown Cooling was lost: _____
2. Last known RCS/SDCS temperature: _____ °F
from instrument number: _____
3. Record the following information and inform the Shift Supervisor on 10 minute intervals

TIME	CET/HJTC °F	HEATUP RATE	TIME TO BOIL

Alternate Method: $T_b = T_a + T_o - T_c$
Where T_b is the remaining time to boil
 T_a is the approximate time to boil from the appropriate curve
 T_o is the time SDC was lost
 T_c is the current time

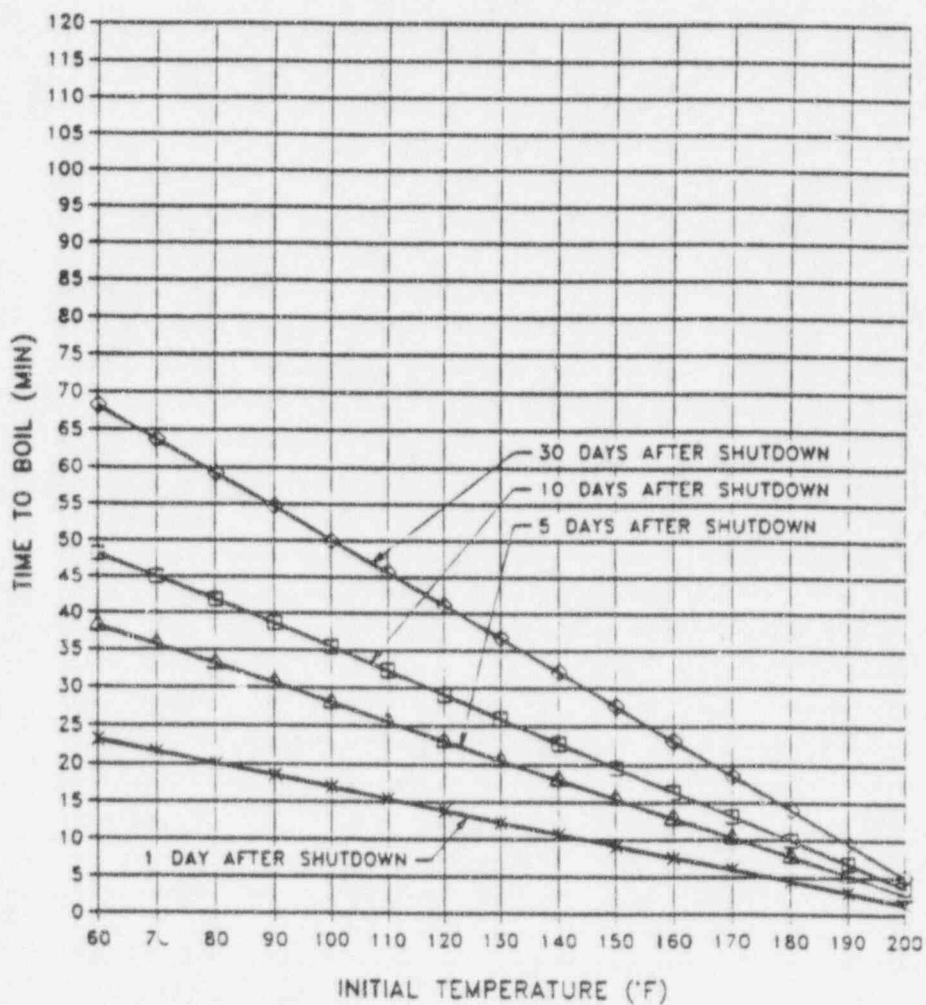
Attachment B

Time to Boil Determination

Time to Boil (RCS at Mid Loop)

APPROXIMATE TIME TO BOIL

RCS AT MID LOOP CONDITIONS



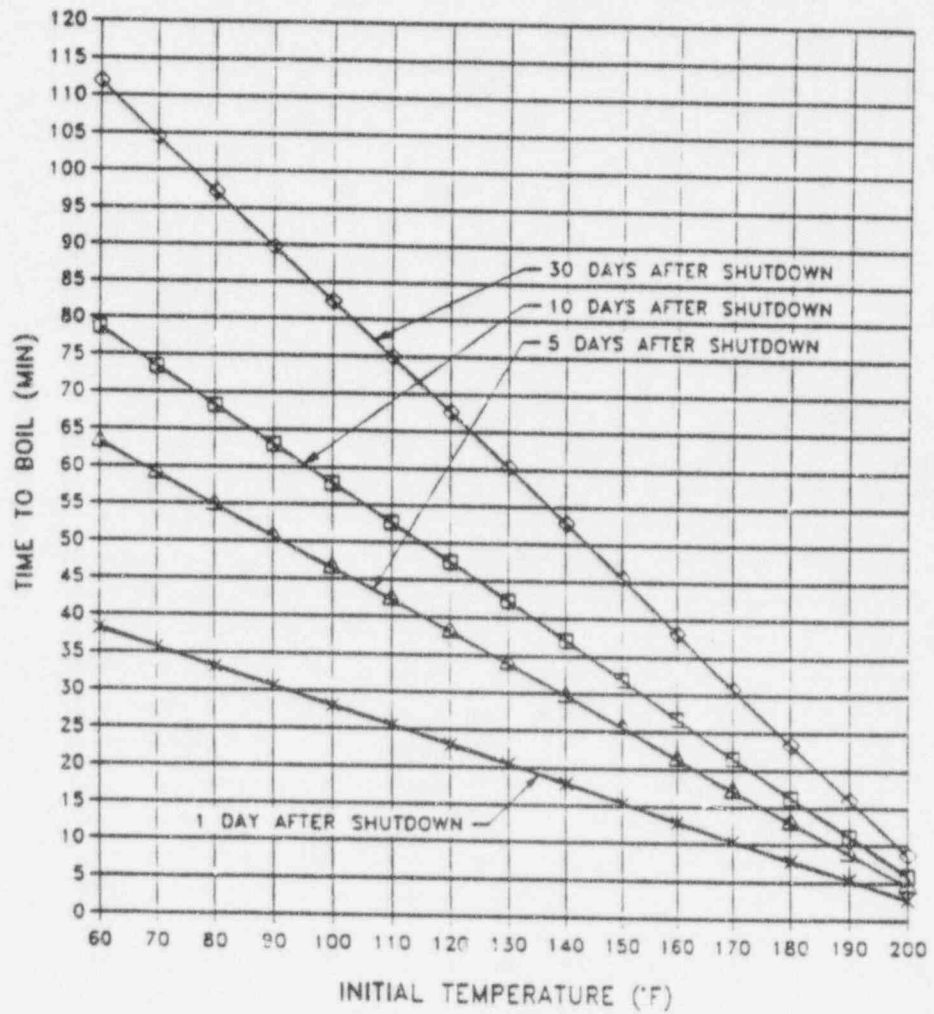
Attachment B

Time to Boil Determination

Time to Boil (RCS at Reactor Vessel Flange)

APPROXIMATE TIME TO BOIL

RCS AT REACTOR VESSEL FLANGE LEVEL CONDITIONS



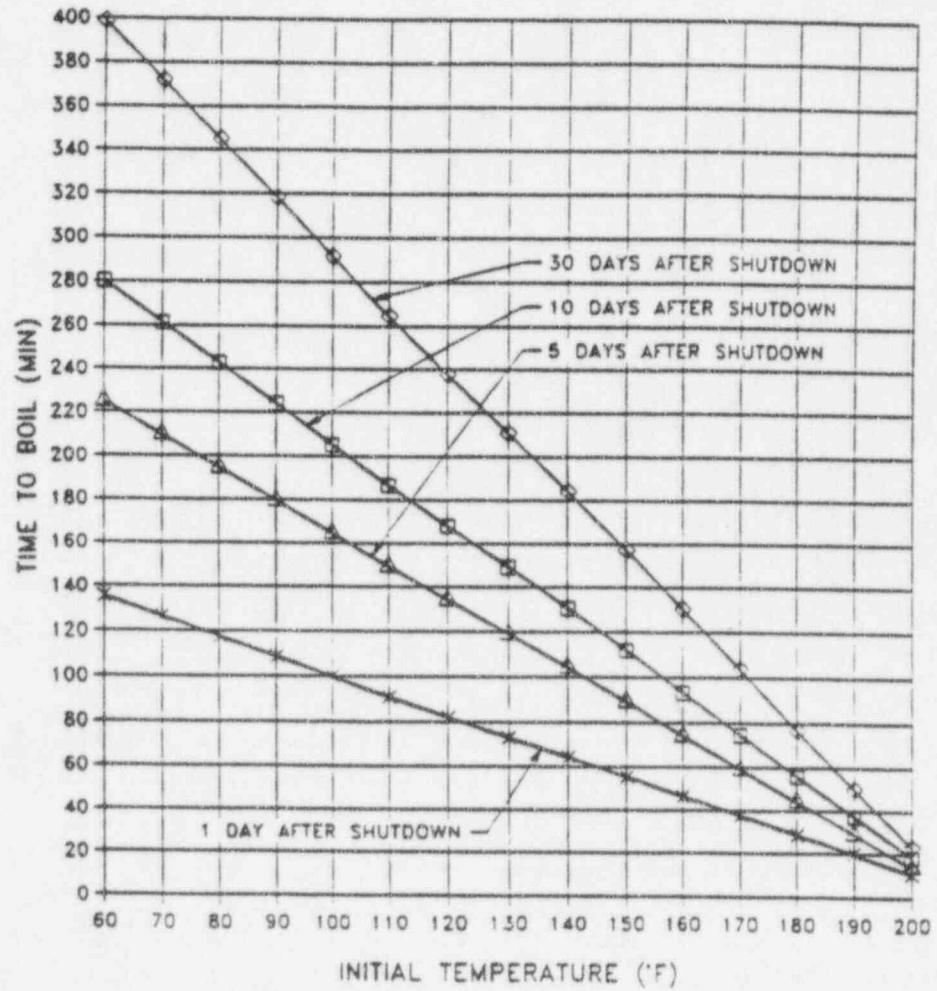
Attachment B

Time to Boil Determination

Time to Boil (RCS at Normal Operating Volume)

APPROXIMATE TIME TO BOIL

RCS AT NORMAL OPERATING LIMITS



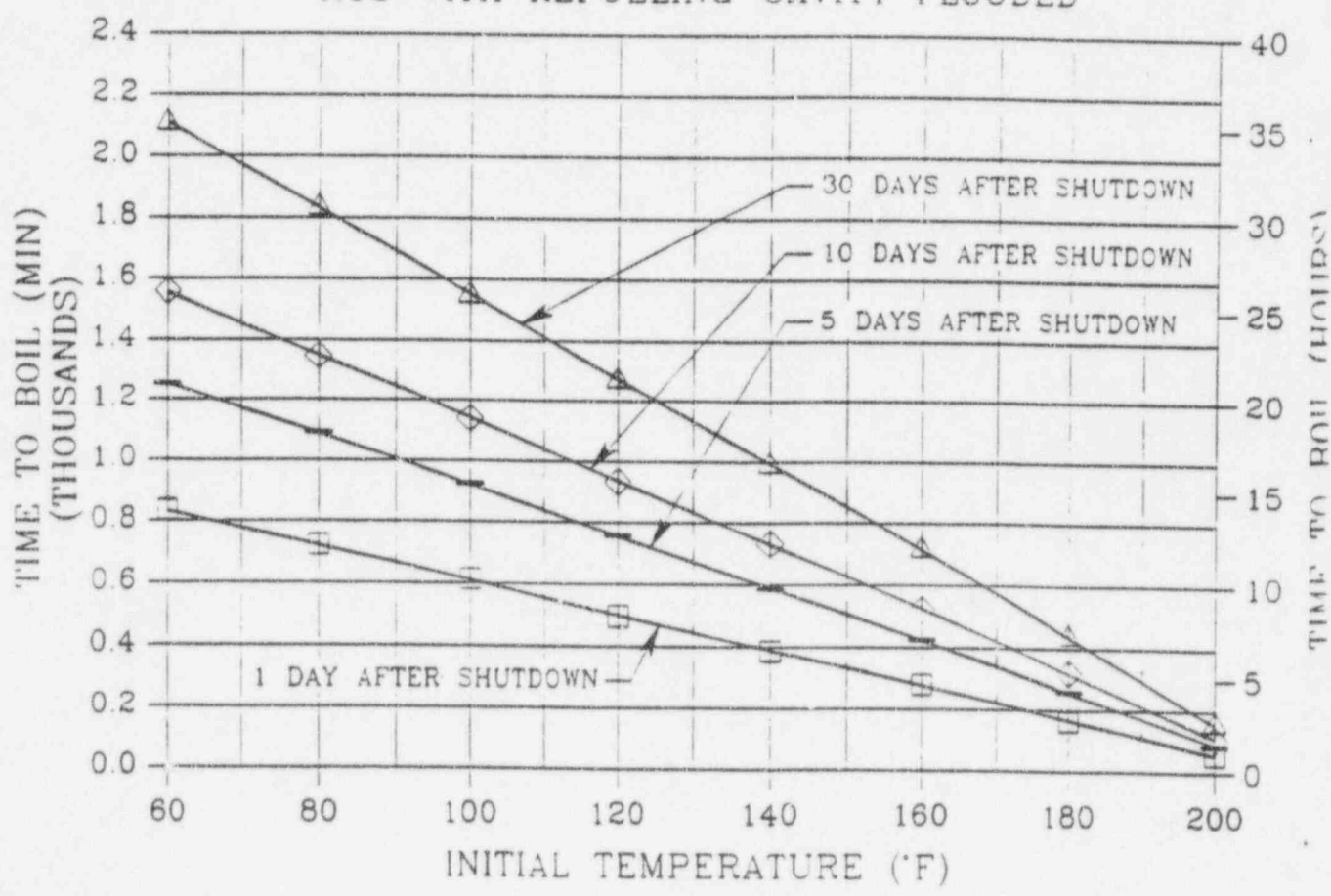
Attachment B

Time to Boil Determination

Time to Boil (Refueling Cavity Flooded)

APPROXIMATE TIME TO BOIL

RCS WITH REFUELING CAVITY FLOODED



End of Attachment B

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits

Applicability

Applies to operation of control element assemblies and monitoring of selected core parameters whenever the reactor is in cold or hot shutdown, hot standby, or power operation conditions.

Objective

To ensure (1) adequate shutdown margin following a reactor trip, (2) the MTC is within the limits of the safety analysis, and (3) control element assembly operation is within the limits of the setpoint safety analysis.

Specification

- (1) Shutdown Margin With $T_{\text{cold}} > 210^{\circ}\text{F}$

Whenever the reactor is in hot shutdown, hot standby or power operation conditions, shutdown margin shall be $\geq 4.0\% \Delta k/k$. With the shutdown margin $< 4.0\% \Delta k/k$, initiate and continue boration until the required shutdown margin is achieved.

- (2) Shutdown Margin With $T_{\text{cold}} \leq 210^{\circ}\text{F}$

Whenever the reactor is in cold shutdown conditions, the shutdown margin shall be $\geq 3.0\% \Delta k/k$. With the shutdown margin $< 3.0\% \Delta k/k$, initiate and continue boration until the required shutdown margin is achieved.

- (3) Moderator Temperature Coefficient

The moderator temperature coefficient (MTC) shall be:

- a. Less positive than $+0.2 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties for power levels at or above 80% of rated power.
- b. Less positive than $+0.5 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties for power levels below 80% of rated power.
- c. More positive than $-3.0 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties at rated power.

With the moderator temperature coefficient confirmed outside any one of above limits, change reactivity control parameters to bring the extrapolated MTC value within the above limits within 3 hours or be in at least hot shutdown within 6 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

Control Element Assemblies

* (4) Full Length CEA Position During Power Operation

All full length (shutdown and regulating) CEA's shall be operable with each CEA of a given group positioned within 12 inches (actual position) of all other CEA's in its group. If one or more of the CEA's is inoperable or misaligned, determine the cause and comply with one of the following:

- a. If one or more full length CEA's are inoperable due to: 1) being immovable as a result of excessive friction or mechanical interference, or 2) known to be untrippable, determine that the shutdown margin requirement of Specification 2.10.2(1) is satisfied within 1 hour and be in at least hot shutdown within 7 hours.
- b. With one full length CEA inoperable due to causes other than addressed in item a. above, and inserted beyond the Long Term Steady State Insertion Limits but within its above specified alignment requirements, power operation may continue for up to 7 EFPD's per occurrence with a total accumulated time of < 14 EFPD per fuel cycle.
- c. With one full length CEA inoperable due to causes other than addressed in item a. above, but within its above specified alignment requirements and either fully withdrawn or above the Long Term Steady State Insertion Limits if in CEA group 4, power operation may continue.
- d. With one or more full length CEA's misaligned from any other CEA's in its group by more than 12 inches but less than 18 inches (actual position) within one hour either:
 - (i) Restore the misaligned CEA(s) to within 12 inches (actual position) of any other CEA's in its own group (realignment shall be made while maintaining the allowable CEA sequence and CEA insertion limits of the Power Dependent Insertion Limits Figure provided in the COLR; or
 - (ii) Declare the CEA's inoperable. Power operation may continue provided all of the following conditions are met:
 1. The power level shall be reduced to $\leq 70\%$ of the maximum allowable power level for the existing Reactor Coolant Pump combination within an additional one hour; if negative reactivity insertion is required to reduce power, boration shall be used.

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

2. Within one hour after reducing the power as required by 1., above, the remainder of the CEA's in the group with the inoperable CEA shall be aligned to within 12 inches (actual position) of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits for Power Dependent Insertion Limit Figure provided in the COLR, the power level shall be restricted pursuant to the applicable section of b. or c. above during subsequent operation.
- or
- (iii) Be in hot shutdown within the next 6 hours.
- e.
- With one full length CEA misaligned from any other CEA's in its group by 18 inches or more (actual position), reduce power to $\leq 70\%$ of the maximum allowable power level for the existing Reactor Coolant Pump combination within one hour. If negative reactivity insertion is required to reduce power, boration shall be used. Within one hour after reducing power as required above, either:
- (i) Restore the CEA(s) to within 12 inches (actual position) of any other CEA's in its group (realignment shall be made while maintaining the allowable CEA sequence and CEA insertion limits of the Power Dependent Insertion Limit Figure in the COLR); or
 - (ii) Declare the CEA(s) inoperable and determine that the shutdown margin requirement of Specification 2.10.2(1) is satisfied and align the remainder of the CEA's in the group with the inoperable CEA to within 12 inches (actual position) of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown in the Power Dependent Insertion Limit Figure provided in the COLR. The shutdown margin requirement of Specification 2.10.2(1) shall be determined at least once per shift. The power level shall be restricted pursuant to the applicable section of b. or c. above during subsequent operation; or
 - (iii) Be in hot shutdown within an additional 5 hours.
- f.
- With more than one full length CEA inoperable or misaligned from any other CEA in its group by 18 inches (actual position) or more, be in at least hot shutdown within 7 hours.

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

(5) Non-trippable CEA Position During Power Operation

All non-trippable CEA's (NTCEA) shall be withdrawn to at least 114 inches (actual position). If one or more NTCEA's becomes misaligned from other NTCEA's by more than 12 inches (actual position) either:

- a. Restore the NTCEA to within the specified alignment requirements within one hour, or
- b. Be in at least hot shutdown within an additional 6 hours.

(6) Shutdown CEA Insertion Limit During Power Operation

All shutdown CEA's shall be withdrawn to at least 114 inches as a condition for reactor criticality, or with one or more shutdown CEA's inserted to more than 114 inches withdrawn, except for surveillance testing, within one hour, either:

- a. Withdraw the CEA's to at least 114 inches, or
- b. Declare the CEA's inoperable and apply Specification 2.10.2(4).

(7) Regulating CEA Insertion Limits During Hot Standby and Power Operation

The regulating CEA groups shall be positioned within the acceptable operating range for regulating rod position of the Power Dependent Insertion Limits Figure provided in the COLR except during CEA exercises above 114 inches. With all CEA's operable, CEA insertion beyond the Long Term Insertion Limits is restricted to:

1. 4 hours per 24 hour interval,
 2. 4 EFPD per 30 EFPD interval, and
 3. 14 EFPD per fuel cycle.
- a. When the regulating CEA groups are inserted beyond the Transient Insertion Limits within two hours, either:
 - (i) Restore the regulating CEA groups to above the Transient Insertion Limits, or
 - (ii) Reduce reactor power to the allowed power of the Power Dependent Insertion Limit Figure of the COLR which permits continued operation above the Transient Insertion Limit using the existing CEA group position.

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

- b. When the regulating CEA groups are inserted beyond the Long Term Insertion Limit for a time interval in excess of 4 hours per 24 hour interval, operation may proceed deleting this daily restriction, provided either:
- (i) Regulating CEA groups are not inserted below the Short Term Insertion Limit, or
 - (ii) Regulating CEA groups are not inserted below the Transient Insertion Limit and rates of power increases initiated when the regulating CEA's are inserted below the Short Term Insertion Limit are less than 5%/hour.
- c. When the regulating CEA groups are inserted below the Long Term Insertion Limit for time intervals in excess of 4 EFPD per 30 EFPD interval and 14 EFPD per fuel cycle, either:
- (i) Restore the regulating groups to within the Long Term Insertion Limit within two hours, or
 - (ii) Be in hot shutdown within 6 hours.

(8) CEA Drop Time

The individual full length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be ≤ 2.5 seconds from the time the clutch coil is de-energized until the CEA reaches its 90 percent insertion position with:

- a. $T_{\text{cool}} \geq 515^{\circ}\text{F}$, and
- b. All reactor coolant pumps operating.

With the drop time of any full length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to hot standby or power operation.

(9) Test Exemption

a. CEA Insertion Limits and Misalignment

- (i) The insertion limits of Specification 2.10.2 may be suspended during the performance of physics tests provided:

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

1. The power is restricted to the test power plateau which shall not exceed (85%) of rated power, and
 2. The power shall be determined at least once per hour during physics tests.
 3. The linear heat rate shall be determined to be within the limits of Specification 2.10.4(1) by monitoring it continuously with the Incore Detector Monitoring System during physics tests above 5% of rated power.
- (ii) The alignment requirements of Specification 2.10.2(4) and insertion limits of Specification 2.10.2(7) may be suspended during the performance of physics tests to determine the isothermal temperature coefficient and power coefficient provided:
1. Only the center CEA (CEA 4-1) is misaligned, and
 2. The linear heat rate shall be determined to be within the limits of Specification 2.10.4(1) by monitoring it continuously with the Incore Detector Monitoring System during physics test above 5% of rated power.
- (iii) With any of the limits of Specification 2.10.4(1) being exceeded while the requirements of Specification 2.10.2(4), (5), (6), and (7) are suspended, either:
1. Reduce power sufficiently to satisfy the requirements of Specification 2.10.4(1), or
 2. Be in hot shutdown within 6 hours.

b. Shutdown Margin

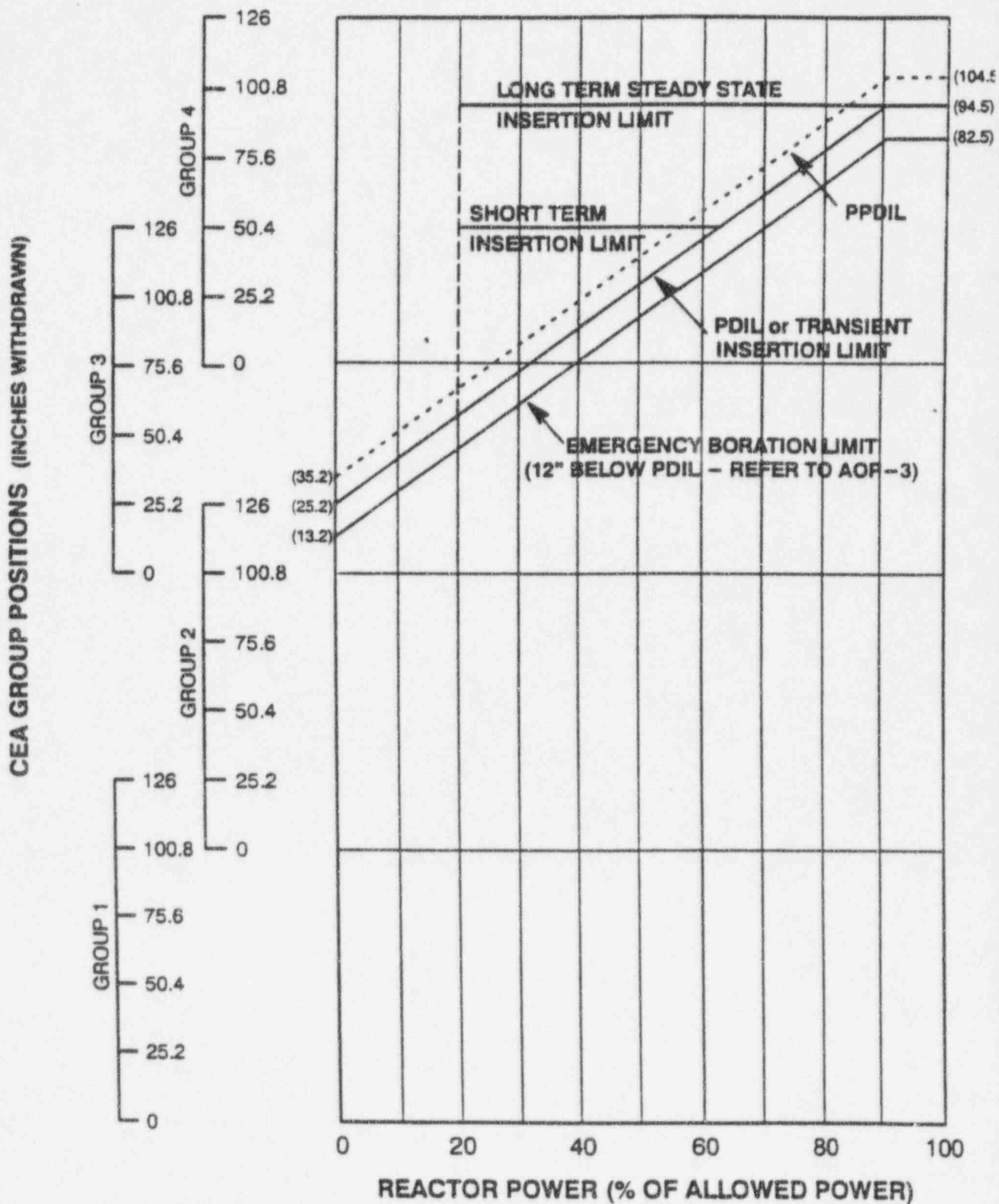
- (i) The shutdown margin required by 2.10.2(1) may be reduced during physics testing at power levels less than 10⁻¹% of rated power for measurement of CEA worth and shutdown margin provided that:
1. Reactivity equivalent to at least the highest estimated CEA worth is available from the operable CEA groups withdrawn (assuming the most reactive CEA of the groups withdrawn is stuck in the fully withdrawn position), and

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

2. The position of each trippable CEA required shall be determined at least once per 2 hours, and
 3. Each CEA not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 7 days prior to reducing the Shutdown Margin to less than the limits of Specification 2.10.2(1).
 - (ii) If the shutdown margin specified in part (i) above is not available, immediately initiate and continue boration until the requirements of 2.10.2(1) are met.
 - (iii) The shutdown margin specified in part (i) above shall be verified every 8 hour shift.
- c. Moderator Temperature Coefficient
- (i) The moderator temperature coefficient (MTC) requirements of 2.10.2(3) may be suspended during physics tests at less than 10^{-1} % of rated power.
 - (ii) If power exceeds 10^{-1} % of rated power, either:
 1. Reduce power to less than 10^{-1} % of rated power within 15 minutes, or
 2. Be in hot shutdown in 2 hours.



CYCLE 16
 COLR

POWER DEPENDENT INSERTION LIMIT

FIGURE
 2

**U. S. NUCLEAR REGULATORY COMMISSION
SITE-SPECIFIC
WRITTEN EXAMINATION**

APPLICANT INFORMATION

Name: Exam	Region: I / II / III / (IV) / V
Date: 12/04/95	Facility/Unit: Fort Calhoun
License Level: RO / (SRO)	Reactor Type: W / (CE) / BW / GE

INSTRUCTIONS

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires a final grade of at least 80 percent. Examination papers will be picked up 4 hours after the examination starts.

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

Applicant's Signature

RESULTS

Examination Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

1. Cheating on the examination will result in a denial of your application and could result in more severe penalties.
2. After you complete the examination, sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination.
3. To pass the examination, you must achieve a grade of 80 percent or greater.
4. The point value for each question is indicated in parentheses after the question number.
5. There is a time limit of 4 hours for completing the examination.
6. Use only black ink or dark pencil to ensure legible copies.
7. Print your name in the blank provided on the examination cover sheet and the answer sheet.
8. Mark your answers on the answer sheet provided and do not leave any question blank.
9. If the intent of a question is unclear, ask questions of the examiner only.
10. Restroom trips are permitted, but only one applicant at a time will be allowed to leave. Avoid all contact with anyone outside the examination room to eliminate even the appearance or possibility of cheating.
11. When you complete the examination, assemble a package including the examination questions, examination aids, and answer sheets and give it to the examiner or proctor. Remember to sign the statement on the examination cover sheet.
12. After you have turned in your examination, leave the examination area as defined by the examiner.

Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

001	a	b	c	d	----	026	a	b	c	d	----
002	a	b	c	d	----	027	a	b	c	d	----
003	a	b	c	d	----	028	a	b	c	d	----
004	a	b	c	d	----	029	a	b	c	d	----
005	a	b	c	d	----	030	a	b	c	d	----
006	a	b	c	d	----	031	a	b	c	d	----
007	a	b	c	d	----	032	a	b	c	d	----
008	a	b	c	d	----	033	a	b	c	d	----
009	a	b	c	d	----	034	a	b	c	d	----
010	a	b	c	d	----	035	a	b	c	d	----
011	a	b	c	d	----	036	a	b	c	d	----
012	a	b	c	d	----	037	a	b	c	d	----
013	a	b	c	d	----	038	a	b	c	d	----
014	a	b	c	d	----	039	a	b	c	d	----
015	a	b	c	d	----	040	a	b	c	d	----
016	a	b	c	d	----	041	a	b	c	d	----
017	a	b	c	d	----	042	a	b	c	d	----
018	a	b	c	d	----	043	a	b	c	d	----
019	a	b	c	d	----	044	a	b	c	d	----
020	a	b	c	d	----	045	a	b	c	d	----
021	a	b	c	d	----	046	a	b	c	d	----
022	a	b	c	d	----	047	a	b	c	d	----
023	a	b	c	d	----	048	a	b	c	d	----
024	a	b	c	d	----	049	a	b	c	d	----
025	a	b	c	d	----	050	a	b	c	d	----

Multiple Choice - Circle your choice

If you change your answer, write your selection in the blank.

- | | | | | | | | | | | | |
|-----|---|---|---|---|------|-----|---|---|---|---|------|
| 051 | a | b | c | d | ---- | 076 | a | b | c | d | ---- |
| 052 | a | b | c | d | ---- | 077 | a | b | c | d | ---- |
| 053 | a | b | c | d | ---- | 078 | a | b | c | d | ---- |
| 054 | a | b | c | d | ---- | 079 | a | b | c | d | ---- |
| 055 | a | b | c | d | ---- | 080 | a | b | c | d | ---- |
| 056 | a | b | c | d | ---- | 081 | a | b | c | d | ---- |
| 057 | a | b | c | d | ---- | 082 | a | b | c | d | ---- |
| 058 | a | b | c | d | ---- | 083 | a | b | c | d | ---- |
| 059 | a | b | c | d | ---- | 084 | a | b | c | d | ---- |
| 060 | a | b | c | d | ---- | 085 | a | b | c | d | ---- |
| 061 | a | b | c | d | ---- | 086 | a | b | c | d | ---- |
| 062 | a | b | c | d | ---- | 087 | a | b | c | d | ---- |
| 063 | a | b | c | d | ---- | 088 | a | b | c | d | ---- |
| 064 | a | b | c | d | ---- | 089 | a | b | c | d | ---- |
| 065 | a | b | c | d | ---- | 090 | a | b | c | d | ---- |
| 066 | a | b | c | d | ---- | 091 | a | b | c | d | ---- |
| 067 | a | b | c | d | ---- | 092 | a | b | c | d | ---- |
| 068 | a | b | c | d | ---- | 093 | a | b | c | d | ---- |
| 069 | a | b | c | d | ---- | 094 | a | b | c | d | ---- |
| 070 | a | b | c | d | ---- | 095 | a | b | c | d | ---- |
| 071 | a | b | c | d | ---- | 096 | a | b | c | d | ---- |
| 072 | a | b | c | d | ---- | 097 | a | b | c | d | ---- |
| 073 | a | b | c | d | ---- | 098 | a | b | c | d | ---- |
| 074 | a | b | c | d | ---- | 099 | a | b | c | d | ---- |
| 075 | a | b | c | d | ---- | 100 | a | b | c | d | ---- |

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 1 1 Point

The following events occur:

- The plant is at full power.
- Rod Drive Clutches are being supplied from Instrument Buses A and C.
- Instrument Bus B is deenergized.
- The operator then inadvertently switches a clutch power supply from Instrument Bus A to Instrument Bus B.

Which one of the following describes the effect that this action will have on CEA position?

- a. No effect.
- b. The shutdown CEAs will drop.
- c. All CEAs will drop.
- d. RPS will generate a reactor trip on one channel.

QUESTION 2 1 Point

During a startup, the connection between the drive mechanism for a high worth Shutdown CEA and its poison fingers becomes uncoupled. As a result, the drive mechanism withdraws normally but all poison fingers associated with it remain fully inserted in the core. Which one of the following describes a symptom that the operators will see as a result of this event?

- a. The affected rod bottom light will remain on.
- b. The SCEAPIS will show no rod motion for that CEA.
- c. Criticality will occur below the PDIL.
- d. The ECP will predict criticality at a higher than actual CEA position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 3

1 Point

The following conditions exist:

- A reactor trip due to a loss of offsite power has occurred.
- An inadvertent SGIS occurred after the trip.
- MS-291 ('A' S/G relief) is open.
- MS-292 ('B' S/G relief) will not open.
- Pressurizer level is 50%.
- Subcooling Margin is 50°F.
- Present RCS Cooldown Rate is 100°F/hr.

Which one of the following describes the expected natural circulation patterns that will develop under these condition?

- a. No natural circulation will develop.
- b. It will develop in the A loop, the B loop will be stagnant.
- c. It will develop in the A loop, reflux boiling will develop in the B loop.
- d. It will develop in the 'A' loop but flow will occur in both loops.

QUESTION 4

1 Point

Which one of the following describes the automatic operation of PCV-1753 (Instrument Air/Service Air Cross Tie)?

- a. It closes if service air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- b. It closes if service air pressure decreases to 80 psig but must be reopened manually.
- c. It closes when instrument air pressure decreases to 80 psig and reopens when pressure increases to 85 psig.
- d. It closes when instrument air pressure decreases to 80 psig but must be reopened manually.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 5

1 Point

The following conditions exist:

- A LOCA has occurred.
- All HPSI pumps are injecting.
- PPLS has been reset.
- Containment spray is in operation.
- Containment pressure is 6 psig.
- The current source of water is the containment sump.
- RAS has not been reset.

Resetting RAS under these conditions will result in which one of the following consequences?

- a. Potential damage to the lockout relays.
- b. It will be possible to start the LPSI pumps.
- c. The containment spray pumps will trip.
- d. The water source will swap back to the SIRWT.

QUESTION 6

1 Point

The heated junction thermocouples measure percent of level over which one of the following ranges?

- a. Top of the vessel (100%) to bottom of the vessel (0%).
- b. Top of the core (100%) to bottom of the core (0%).
- c. Top of the vessel (100%) to top of the core (0%).
- d. Top of the core (100%) to the bottom of the vessel (0%).

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 7

1 Point

The following post-trip conditions exist:

- RCS pressure=500 psia.
- Tc=410°F
- Th=440°F
- CET Average=445°F

Which one of the following actions is required concerning the RCPs?

- a. No action is required.
- b. Trip only one RCP.
- c. Trip one RCP in each loop.
- d. Trip all RCPs.

QUESTION 8

1 Point

The following conditions exist:

- The reactor has tripped as a result of a loss of offsite power.
- D1 and D2 have energized 1A3 and 1A4.
- Auxiliary Feed Pumps will not start.
- Steam Generator levels are currently 20% WR and slowly lowering.
- All other safety functions are met.

Which one of the following procedures should be implemented immediately after EOP-00?

- a. EOP-02.
- b. EOP-06.
- c. EOP-20/HR-2
- d. EOP-20/HR-4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 9

1 Point

During an entry into a Confined Space within the RCA, the Confined Space Entry Permit is maintained at which one of the following places?

- a. Confined Space Access Point.
- b. RCA Access Control Point.
- c. Shift Supervisor's Office.
- d. Industrial Safety Coordinator's Office.

QUESTION 10

1 Point

Following a CIAS, how can sampling of the containment sump be accomplished?

- a. Containment sump sample lines do not isolate on a CIAS.
- b. A manual bypass valve is provided to allow sampling of the containment sump following a CIAS.
- c. The isolation signal for the valves can be temporarily bypassed and the valves opened following a CIAS.
- d. No containment sump sample can be taken until the CIAS is reset.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 11 1 Point

Prior to placing a Gas Decay Tank in service, which one of the following conditions must be verified?

- a. Iodine-131 dose equivalent less than $1\mu\text{Ci/gm}$.
- b. Total activity less than $1\mu\text{Ci/gm}$.
- c. Oxygen concentration less than 3%.
- d. Nitrogen concentration greater than 20%.

QUESTION 12 1 Point

The plant is operating at full power when high radiation in the Auxiliary Building results in a VIAS. Which one of the following describes the response of the Spent Fuel Area Charcoal Filters (VA-66) to this event?

- a. They will not be affected.
- b. Their bypass damper (HCV-712A) will close and their isolation damper (HCV-712B) will open.
- c. Their bypass damper (HCV-712A) will close. Their isolation damper (HCV-712B) will not be affected.
- d. Their bypass damper (HCV-712A) will not be affected. Their isolation damper (HCV-712B) will open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 13

1 Point

Which one of the following is an indication of RCS void formation during a natural circulation cooldown?

- a. Pressurizer level lowers while operating auxiliary pressurizer spray.
- b. The RCS can not be depressurized to SDC entry conditions.
- c. RCS subcooling is 25°F.
- d. A rapid increase in indicated Reactor Vessel Level on QSPDS.

QUESTION 14

1 Point

The following sequence of events occurs:

- An SIAS starts all ECCS pumps.
- The diesels are running normally.
- Offsite power is lost.
- None of the RCP breakers open on Load Shed.

Which one of the following describes the effect that these events will have on the restart of the ECCS pumps as a result of load sequencer operation?

- a. All ECCS pumps will restart normally.
- b. Only the HPSI pumps will restart.
- c. All except the HPSI pumps will restart.
- d. No ECCS pumps will restart.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 15

1 Point

The following plant conditions exist:

- The reactor is in Mode 4.
- The pressurizer manway is in place.
- Shutdown Cooling is in service.
- Shutdown Cooling Isolation Valves (HC-347/348) then go fully closed.

Which one of the following is the most likely cause of these events?

- a. Pressurizer pressure channel P-115 has failed low.
- b. Pressurizer pressure channel P-118 has failed low.
- c. Power has been lost to pressurizer pressure channel P-115.
- d. Power has been lost to pressurizer pressure channel P-118.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 16

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- The Tave signal from Channel A RRS to the Pressurizer level control system fails upscale.
- The operator immediately takes the A/B switch on panel CB-4 to B.
- The Pressurizer level channel selector switch is selected to X.

Which one of the following is the expected consequence of these events?

- a. Actual and indicated pressurizer level will be unaffected.
- b. Indicated pressurizer level will decrease, actual level will be unaffected.
- c. Actual pressurizer level will decrease.
- d. Actual pressurizer level will increase.

QUESTION 17

1 Point

Under which one of the following conditions will the Subcooled Margin Monitors on CB-4 provide invalid results?

- a. With Containment Pressure greater than 5 psig.
- b. With Pressurizer Pressure below 1700 psia.
- c. With RCS Coolant Temperatures below 465°F
- d. With Containment Temperature above 180°F.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 18

1 Point

The following conditions exist:

- River temperature is 55°F.
- The plant is operating at full power.
- Raw Water Pump AC-10A has been inop for the past 3 days.
- Containment Spray Pump SI-3B has just been declared inop.

In order to satisfy the requirements of Tech Specs, these conditions require that the plant be taken to HOT SHUTDOWN within which one of the following times?

- a. The plant should already be in HOT SHUTDOWN.
- b. 36 hours.
- c. 4½ Days.
- d. 7½ days.

QUESTION 19

1 Point

The following conditions exist:

- The plant is in Cold Shutdown for a refueling outage.
- The containment purge system is operating in the low purge rate mode with fan VA-77.
- A high alarm occurs on radiation monitor RM-062 [stack gas monitor].

Which one of the following describes the expected response of the containment purge system to these events?

- a. The inboard containment isolation valves only would close and the low purge rate fan would trip.
- b. The outboard containment isolation valves only would close and the low purge rate fan would trip
- c. Both the inboard and the outboard isolation valves would close and the low purge fan would trip.
- d. No automatic action would occur.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 20

1 Point

The MSIVs are open when power is lost on DC bus #2. Which one of the following describes the effect that this event will have on the MSIVs?

- a. An SGLS A will be generated and both MSIVs will close.
- b. An SGLS B will be generated and both MSIVs will close.
- c. An SGLS B will be generated and MSIV 1042A will close.
- d. An SGLS B will be generated but neither MSIV will close.

QUESTION 21

1 Point

The following conditions exist:

- The plant is at 100% power.
- All major breakers are in their normal lineup.
- The electrical distribution system is aligned for automatic operation.
- The control switch for breaker 1A11 is then turned to the open (green flag) position.

Which one of the following will occur as a result of these conditions?

- a. Breaker 1A11 will not open unless breaker 1A31 is closed first.
- b. A fast transfer will occur with breaker 1A31 closing before breaker 1A11 opens.
- c. A fast transfer will occur with breaker 1A11 opening before breaker 1A31 closes.
- d. Breaker 1A11 will open but breaker 1A31 will not close.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 22

1 Point

Diesel generator D1 has received a start signal as a result of a reactor trip. The engine lube oil pump discharge pressure switch has failed in the low pressure position. Which one of the following describes the expected response of D1 to these events?

- a. It will not start.
- b. It will start but will trip after 15 seconds.
- c. It will start and then idle at 500 rpm.
- d. It will start and then run at 900 rpm.

QUESTION 23

1 Point

With the plant operating at full power, which one of the following diesel generator operability histories is in compliance with the requirements of Tech Spec 2.7 2(j)?

- a. DG-1 is inop from 4/26 to 5/4
- b. DG-2 is inop from 4/24 to 4/30 and from 5/2 to 5/5
- c. DG-1 is inop from 4/20 to 4/25 and DG-2 is inop from 4/26 to 4/30.
- d. DG-1 is inop from 4/25 to 4/30 and DG-2 is inop from 4/28 to 5/2.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 24

1 Point

Which one of the following conditions will cause the Control Room Ventilation System to automatically switch to the Filtered Air makeup mode of operation?

- a. High inlet Chlorine.
- b. Smoke detected in control room exhaust.
- c. High Iodine activity detected by RM-065.
- d. Containment Radiation High Signal (CRHS) actuation

QUESTION 25

1 Point

The following conditions exist:

- RCS temperature is being maintained on Shutdown Cooling.
- All controls are in auto.
- The operator takes action to decrease RCS temperature.

Which one of the following describes the response of Shutdown Cooling Valves HCV-341 and FCV-326 to this action?

- a. HCV-341 throttles open, FCV-326 throttles closed.
- b. HCV-341 throttles closed, FCV-326 throttles open.
- c. Both valves throttle closed.
- d. Both valves throttle open.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 26

1 Point

With the reactor at power, which one of the following is the most reliable indication that a Pressurizer PORV is leaking?

- a. PORV position indicator.
- b. Tail pipe temperature.
- c. Quench tank pressure.
- d. Quench tank temperature.

QUESTION 27

1 Point

At which one of the following containment hydrogen concentrations is initiation of Hydrogen Purge required?

- a. 3%
- b. 5%
- c. 7%
- d. 9%

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 28

1 Point

If the turbine has failed to trip following a reactor trip, which one of the following explains why the contingency action of tripping the EHC pumps is preferred over closing the MSIVs and MSIV bypass valves?

- a. To prevent a possible Turbine overspeed.
- b. To retain the use of MS-291 and MS-292.
- c. To retain the use of the atmospheric and condenser steam dump valves.
- d. To minimize RCS cooldown.

QUESTION 29

1 Point

The following conditions exist:

- Raw Water pumps AC-10A & 10B are running.
- Raw Water pumps AC-10C & 10D are in standby.
- Pump AC-10A trips on an overload fault.

Which one of the following lists the Raw Water pumps expected to be running after this event?

- a. 10C & 10D
- b. 10B & 10D
- c. 10D only
- d. 10B only

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 30

1 Point

Section IV of AOP-23, (Reset of Containment Isolation Actuation Signal (CIAS) and Reset of Ventilation Isolation Actuation Signal (VIAS)), step 4; directs the operator to ensure the Hand Controller thumbwheels for any open HCV-400'C' series CCW valve are set fully counter-clockwise. Which one of the following describes why this direction is necessary?

- a. Ensures adequate CCW flow to the Containment Cooling coils when CIAS is actuated.
- b. Ensures that CCW relief valves do not lift during resetting of CIAS lockouts.
- c. Ensures adequate CCW flow to the Containment Cooling coils when VIAS is actuated.
- d. Ensures that CCW relief valves do not lift during resetting of VIAS lockouts.

QUESTION 31

1 Point

A reactor trip has occurred but one CEA failed to insert because its clutch failed to disengage. Which one of the following will prevent the affected CEA from driving to its LEL in response to a Rod Rndown (RRD)?

- a. Loss of power to the 400 Hz inverter.
- b. Drive Mode Selector Switch in either of the auto positions (AS, AG).
- c. Drive Mode Selector Switch in any of the manual positions (MS, MG, MI).
- d. Drive Mode Selector Switch in the OFF position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 32

1 Point

The following plant conditions exist:

- The plant is at 75% power.
- All CEAs are out.
- Boron Concentration is 650 ppm
- Core age is 10,000 MWD/T

Reactor power is to be increased to 100%. Neglecting the effects of xenon, which one of the following is closest to the boron concentration at 100% power?

- a. 550 ppm
- b. 610 ppm
- c. 630 ppm
- d. 690 ppm

QUESTION 33

1 Point

Which one of the following describes the expected response of the CCW Heat Exchanger Bypass Valve (HCV-497) to an SIAS?

- a. Goes fully open.
- b. Goes fully closed.
- c. Closes to minimum flow (15% open).
- d. Does not change position.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 34

1 Point

The plant is operating at full power when Pressurizer Pressure Sigma Meter (A/P-102) fails high. Which one of the following is the expected consequence of this event?

- a. PPLS logic becomes 2/3, otherwise no actions occur.
- b. PPLS will automatically block.
- c. Backup heaters energize, pressure increases, spray valves open, and pressure stabilizes at a higher value.
- d. Backup heaters deenergize, pressure decreases, proportional heaters energize, and pressure stabilizes at a lower value.

QUESTION 35

1 Point

EOP-05 (Uncontrolled Heat Extraction) directs the operators to terminate Containment Spray as soon as containment pressure decreases below 3 psig. Which one of the following is the basis for minimizing the amount of spray following a steam line break?

- a. Minimize depletion of Tri-Sodium Phosphate.
- b. Reduce the possibility of Pressurized Thermal Shock.
- c. Minimize the amount of hydrogen generation.
- d. Allow the start of the containment cooling system.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 36

1 Point

The following conditions exist:

- A steam leak has occurred in Room 19.
- The leak was isolated after 30 minutes.
- The leak was upstream of the AFW steam supply check valve.
- The leak was isolated by closing YCV-1045B and its warmup valves.

The operability of which one of the following components is LEAST likely to be affected by these events?

- a. FW-6.
- b. FW-10.
- c. The control room start air compressor.
- d. The standby air compressor.

QUESTION 37

1 Point

A site blackout has occurred and DC loads have been minimized in accordance with EOP-07. Which one of the following specifies the amount of time that the control room instrumentation may be relied upon under these conditions?

- a. 1 hour
- b. 4 hours
- c. 8 hours
- d. 12 hours

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 38

1 Point

With a normal electrical system lineup, which one of the following describes how Instrument Bus 'C' would be powered following failure of its Inverter?

- a. Power would be lost until manually restored.
- b. The supply would automatically switch to the bypass transformer for inverter C.
- c. The Cross Tie breakers between instrument buses A and C would automatically close to supply instrument bus C.
- d. The Cross Tie breakers between instrument buses 1 and C would automatically close to supply instrument bus C.

QUESTION 39

1 Point

Which one of the following describes the expected response of the Fire Protection System to a fire in the East Switchgear Room?

- a. The first detector actuated causes the ventilation dampers to the affected space to shut. After a 60 second time delay, the halon bank discharge is initiated.
- b. After two detectors have actuated in the same space, the ventilation dampers for both switchgear rooms shut and the halon bank discharge is initiated.
- c. The first detector actuated causes the ventilation dampers in both switchgear rooms to shut. The second detector actuated causes the halon bank to discharge.
- d. After two detectors have actuated in the same space, the ventilation dampers in both switchgear rooms shut. After a 60 second time delay, the halon bank discharge is initiated.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 40

1 Point

The following conditions exist:

- The control room has been evacuated.
- A plant cooldown must be conducted from the Alternate Shutdown Panel.

Which one of the following describes the actions necessary to avoid PPLS during this cooldown?

- a. PPLS must be blocked as part of the process of evacuating the control room.
- b. PPLS will not auto initiate with control at the Alternate Shutdown Panel.
- c. All affected equipment must be placed in Pull-to-Lock locally at their breaker panels.
- d. The control power fuses of all affected equipment are removed from their breakers cabinets.

QUESTION 41

1 Point

With the plant at power and no evolutions in progress, which one of the following conditions requires entry into AOP-12 (Loss of Containment Integrity)?

- a. HCV-746A (Pressure Relief) is opened.
- b. One of the Personnel Air Lock doors is open.
- c. An unexpected decrease in containment pressure has occurred.
- d. A containment isolation MOV is inoperable but is locked closed.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 42

1 Point

EOP-06 (Loss of All Feedwater) directs the operators to trip all RCPs. Which one of the following describes the basis for this action?

- a. Flow from the RCPs would interfere with bleed and feed cooling.
- b. Eliminate the RCPs as a source of heat input to the RCS.
- c. Reduce the risk of clad damage due to quenching if a void forms in the vessel.
- d. Allow the stratification of phases so that liquid water remains in the low point (i.e. reactor vessel).

QUESTION 43

1 Point

If E-Bar is 3.301, which one of the following is the highest RCS activity allowed by technical specifications)?

- a. 30.2 $\mu\text{Ci/gm}$.
- b. 38.1 $\mu\text{Ci/gm}$.
- c. 42.1 $\mu\text{Ci/gm}$.
- d. 48.2 $\mu\text{Ci/gm}$.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 44

1 Point

The following conditions exist:

- No operator actions have been taken.
- Core life is near EOL.
- Power level is 80% and increasing.
- Pressurizer level is following its program level.
- T_{ave} is increasing.
- Containment pressure and temperature are normal.
- Pressurizer pressure is normal.
- All systems are in their normal mode.

Which one of the following is the most likely cause of these conditions?

- a. Partial loss of feedwater heating.
- b. Continuous rod withdrawal.
- c. Steam leak outside containment.
- d. Closure of 1 MSIV.

QUESTION 45

1 Point

Which one of the following is the expected response of nuclear power to a dropped CEA?

- a. The effect on power will be negligible but axial peaking factors will increase.
- b. Power will drop approximately 5% (depending on the worth of the CEA) and remain there. Peaking factors will be unaffected.
- c. Power will drop and then return to near the predrop level. Radial peaking factors will increase.
- d. Power will drop and then return to near the predrop level. The Dropped Rod light on the drawer will be extinguished.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 46

1 Point

Which one of the following describes why it is important for the turbine to trip on a reactor trip?

- a. To preserve steam generator inventory.
- b. To prevent excessive cooldown of the RCS.
- c. To prevent turbine damage due to a loss of load overspeed.
- d. To prevent generator damage due to reverse current.

QUESTION 47

1 Point

The following conditions exist:

- The plant is operating at 100% power.
- Quench tank pressure is being maintained at 7 psig.
- The source of the Quench Tank pressure is that Pressurizer Safety Valve (RC-142) is leaking.

Which one of the following is the temperature expected to be seen on Tailpipe Temperature monitor TIA-136?

- a. 150°F
- b. 230°F
- c. 300°F
- d. 640°F

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 48

1 Point

Which one of the following parameters is the most effective in discriminating between a Small Break LOCA and a Steam Line Break Inside Containment?

- a. Containment Pressure
- b. RCS Pressure
- c. Containment Temperature
- d. Steam Generator Pressure

QUESTION 49

1 Point

The following conditions exist:

- A Large Break LOCA has occurred.
- All safeguards components are operating as required.
- The LO on the primary has announced that he has received LO-LO level alarms on both concentrated boric acid tanks.
- SIAS actuated 26 minutes ago.
- SIRWT level is 52 inches,

Which one of the following actions should be taken at this time?

- a. Place two charging pumps in pull stop, open LCV-218-2, close LCV-218-3, close HCV's-265, 268 and 258.
- b. Place all charging pumps in pull stop, close HCV-238, 239, 240, and 249, open HCV-247, 248 and 308.
- c. Close HCV's-265, 258, and 268, open HCV-308 or HCV-2988
- d. Continue Emergency Boration for an additional 4 minutes or until charging pumps lose suction.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 50

1 Point

In a recent plant modification, valve (HCV-438C) CCW Containment Isolation Valve was physically reversed. Which one of the following describes the reason that this modification was necessary?

- a. Eliminate the need to cooldown and depressurize in order to isolate a leaking RCP seal cooler.
- b. To facilitate the replacement of CRDM seals.
- c. The valve was initially installed incorrectly.
- d. To reduce the possibility of waterhammer in the CCW system on CIAS.

QUESTION 51

1 Point

The following conditions exist:

- The plant on Shutdown Cooling.
- The 'A' Shutdown Cooling Heat Exchanger is not available.
- Shutdown cooling is provided through the 'B' Shutdown Cooling Heat Exchanger.
- The plant has been shutdown for 10 days.
- RCS temperature is 120°F.
- The refueling cavity is flooded.
- Containment integrity is not set.
- Cooling water is lost to the operating shutdown cooling heat exchanger.

Which one of following states the amount of time before which containment integrity must be reset.

- a. 8 hours
- b. 15 hours
- c. 24 hours
- d. 48 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 52

1 Point

The reactor is critical at $10^{-4}\%$ power when an inadvertent Emergency Boration Occurs. RCS boron concentration is raised by 10 ppm before it is stopped. Which one of the following describes the effect that this event will have on T_c ?

- a. It will decrease the most at BOL.
- b. It will decrease the most at EOL.
- c. It will decrease the same at EOL as at BOL.
- d. It will not be significantly affected.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 53

1 Point

The plant is at $1 \times 10^{-1}\%$ with a shutdown in progress. As power decreases which one of the following would provide positive Control Room indication that the Wide Range Nuclear Instrumentation System was in the 'Extended Range'?

- a. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- b. Between 10^{-4} and $10^{-5}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.
- c. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade INCREASE in indicated reactor power would occur and the reactor power indication on CB-4 switches from $\%$ power to CPS.
- d. Between 10^{-7} and $10^{-6}\%$ power an approximate two decade DECREASE in indicated reactor power would occur and the red 'Extended Range' light will light on the WR Log Drawer in the Control Room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 54

1 Point

The following plant conditions exist:

- The plant is operating at full power.
- CCW to Detector Well Cooling Containment Isolation valve HCV-467B fails closed.

Which one of the following describes the effect that this will have?

- a. Wide range nuclear instrumentation will swap to extended range.
- b. Primary Rod Position Indication must be declared inoperable.
- c. Variable Overpower Trip (VOPT) pretrip.
- d. The Detector Well Cooling Fans will trip.

QUESTION 55

1 Point

Which one of the following describes the basis for the Technical Specification limits on RCS activity?

- a. To limit Aux building dose rates resulting from a loss of coolant accident.
- b. To limit Aux building dose rates resulting from a fuel handling accident.
- c. To limit offsite doses resulting from a steam generator tube rupture accident.
- d. To limit offsite doses resulting from a loss of feedwater accident.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 56

1 Point

Initiation of LTOP is described in the Floating Step; Blocking of PPLS. Which one of the following states when the LTOP mode of the PORV is enabled?

- a. Whenever the PORV switches are in the AUTO position.
- b. Automatically, whenever pressurizer pressure drops below 1600 psia.
- c. When PPLS is blocked by the Operator.
- d. When RCS temperature is less than 320°F

QUESTION 57

1 Point

The following conditions exist:

- All offsite power has been lost.
- The reactor has tripped.
- EDG #1 did not start and 1A3 is not energized.
- #1 DC bus is deenergized due to a dead short.
- The reason for the EDG failure to start has been corrected.

Which one of the following must be accomplished before the #1 Diesel can be started and loaded?

- a. Start the diesel locally, at AI-133.
- b. Place the diesel back in AUTO.
- c. Transfer DC Control Power to its alternate source.
- d. Start the diesel manually, remotely.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 58

1 Point

The plant is in Mode 1 when the EONA reports that the area monitor in corridor 4 is in alarm and reads 200 mRem/hr. Which one of the following AOPs should be entered as a result of this condition?

- a. None
- b. AOP-08 (Fuel Handling Incident)
- c. AOP-09 (High Radioactivity)
- d. AOP-21 (RCS High Activity)

QUESTION 59

1 Point

The following conditions exist:

- The plant is operating at full power.
- Stack radiation is increasing from the controlled access area of the auxiliary building.
- VCT level is lowering.

Which one of the following compartments is the most likely source of the radioactivity?

- a. Room 21
- b. Corridor 26
- c. The spent fuel storage pool
- d. The letdown heat exchanger room

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 60

1 Point

Which one of the following describes the relationship between plant conditions and indicated vs. actual pressurizer level?

- a. A steam leak in containment will cause indicated level to be higher than actual.
- b. A steam leak in containment will cause indicated level to be lower than actual.
- c. A Steam Generator Tube Rupture will cause indicated level to be higher than actual.
- d. A Steam Generator Tube Rupture will cause indicated level to be lower than actual.

QUESTION 61

1 Point

The following conditions exist:

- Fuel handling operations are in progress.
 - Personnel are working both in Containment and the Aux Building.
 - An Aux Building stack monitor alarms.
 - This initiates VIAS.
 - Area Monitor (RM-087) Spent Fuel Pool Wall alarms. Which one of the following actions should be taken?
- a. Reset and restart containment cooling.
 - b. Verify containment integrity is set.
 - c. Evacuate the Aux Building.
 - d. Trip all Aux Building Exhaust Fans.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 62

1 Point

Following a loss of offsite power pressurizer level is to be maintained above 45%. Which one of the following is the reason that this is necessary?

- a. Assure continued heater operation to preserve subcooling.
- b. Assure adequate pressurizer level for RCP start when power is restored.
- c. Assure adequate RCS inventory during any subsequent cooldown.
- d. Assure adequate inventory for reflux boiling if loss of power is prolonged.

QUESTION 63

1 Point

Which one of the following events would require the immediate termination of any Waste Gas Release in progress?

- a. Containment area monitor alarm.
- b. Stack radiation monitor alarm.
- c. Failure of a containment gas monitor.
- d. Failure of the waste gas flow rate recorder.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 64

1 Point

In the course of conducting a Valve Alignment Verification Checklist, the operator discovers that a particular valve is not in the position called for in the checklist. Which one of the following actions should be taken concerning this valve?

- a. Reposition the valve to the position specified in the checklist.
- b. Place a Caution Tag on the valve.
- c. Inform the Security Shift Supervisor and request an investigation.
- d. Contact the control room for further instructions.

QUESTION 65

1 Point

FW-2B has been tagged out of service for both mechanical and electrical work using a group tagout. The Electrical Group Foreman has requested a temporary clearance to perform some testing on the motor. In addition to the Shift Supervisor, who must approve this temporary clearance?

- a. All persons listed on Attachment 1 to the Group Tagout Sheet.
- b. All persons involved in the testing of the motor.
- c. The maintenance planners involved with both the electrical and the mechanical work.
- d. The Duty Supervisor.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 66

1 Point

The RWP Surveillance and ALARA coordinator has determined that an ALARA job briefing is required for performance of a job in the RCA. Which one of the following restrictions apply until all affected workers attend an ALARA Job Briefing?

- a. TLDs may not be issued to affected workers.
- b. Workers may not sign the RWP.
- c. Workers may not enter the protected area.
- d. The Work Order may not be approved.

QUESTION 67

1 Point

Under which one of the following circumstances may a non-licensed member of the Plant Review Committee (PRC) enter the control room without receiving permission from the Shift Supervisor, LSO, or Licensed Operator?

- a. At any time.
- b. During Shift Turnover.
- c. Under Emergency Conditions.
- d. During a plant outage.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 68

1 Point

Which one of the following jobs require the use of a Ground Fault Circuit Interrupter (GFIC)?

- a. Rescue of an injured worker from a live electrical circuit.
- b. Replacing light bulbs in indoor light fixtures.
- c. Using a portable grinder on a piece of stainless steel near the SIRWT.
- d. Working on a de-energized electrical bus.

QUESTION 69

1 Point

In the event of a total loss of feedwater following a reactor trip on low steam generator level from full power, which one of the following specifies the minimum expected time that steam generator inventory can be relied upon to provide a heat sink?

- a. 10 minutes
- b. 20 minutes
- c. 40 minutes
- d. 60 minutes

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 70

1 Point

In responding to an oil spill and fire within the RCA, which one of the following serves as the Incident Commander?

- a. Any Radiation Protection Tech trained in fire fighting.
- b. The Plant Industrial Safety Coordinator.
- c. The Shift SRO.
- d. A Shift RO.

QUESTION 71

1 Point

Which one of the following CANNOT be used to determine the current revision of a procedure?

- a. Check with Document Control.
- b. Use the On-line CHAMPS index.
- c. Check an official copy at locations listed in SO-G-7.
- d. Check Attachment 1 to SO-G-7.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 72

1 Point

Which one of the following conditions requires that EOP-00 be referenced but NOT entered?

- a. RPS actuation following a manual reactor shutdown with T_c at 520°F.
- b. A reactor trip from 1% power with the generator off-line.
- c. A manual reactor trip from full power.
- d. RPS actuation while on shutdown cooling with T_c at 260°F.

QUESTION 73

1 Point

When using the Gaitronics System, which one of the following channels is reserved for operations department use?

- a. Line 1
- b. Line 2
- c. Line 3
- d. Line 4

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 74

1 Point

Following a CIAS, a containment isolation valve which should have closed is stuck in the open position. How will this condition be indicated on the appropriate ERF Computer display page?

- a. The screen symbol for the valve will be green and steady.
- b. The screen symbol for the valve will be green and flashing.
- c. The screen symbol for the valve will be red and steady.
- d. The screen symbol for the valve will be red and flashing.

QUESTION 75

1 Point

An RO initiated a containment vent but did not remember to log it for several hours. Which one of the following is the correct way for this entry to be made?

- a. Insert the entry such that the sequence of events on the page is correct.
- b. Make a normal log entry marking it as a late entry in the time column.
- c. Make a normal log entry and then draw a line to the page location where it should have been entered initially.
- d. No action is required. Containment vents do not need to be logged.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 76

1 Point

Which one of the following describes the effect of a dropped rod on DNBR over the hour following the event? (Assume no operator action is taken.)

- a. DNBR improves immediately and then remains constant over the hour due to the decrease in power level.
- b. DNBR improves immediately due to power decrease and then deteriorates over the hour due to the effects of xenon.
- c. DNBR gets worse immediately due to flux distribution and then improves over the hour due to the effects of fuel temperature.
- d. DNBR gets worse immediately due to flux distribution and then gets worse over the hour due to the effects of xenon.

QUESTION 77

1 Point

During a LOCA, the EOPs may direct that all RCPs be secured. Which one of the following is the basis for taking this action?

- a. To retard the rate of RCS depressurization.
- b. To prevent possible pump damage from running under voided conditions.
- c. To allow stratification of phases thereby reducing rate of inventory loss.
- d. To remove the RCPs as a source of heat input to the RCS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 78

1 Point

Which one of the following conditions would indicate that natural circulation cooling may be losing its effectiveness?

- a. Cold leg temperature is 25°F lower than hot leg temperature.
- b. Cold leg temperature is 25°F lower than core exit thermocouple temperature.
- c. Hot leg temperature is 25°F lower than core exit thermocouple temperature.
- d. Hot leg temperature is 25°F lower than pressurizer temperature.

QUESTION 79

1 Point

The following plant conditions exist:

- A station blackout has occurred.
- The diesel engines have both failed to start.
- Natural circulation cooling has been established.

Assuming no change in conditions, which one of the following courses of action should be taken by the operators?

- a. Cooldown at the maximum rate possible to the point at which shutdown cooling entry conditions are satisfied.
- b. Cooldown at 100°F/hr until shutdown cooling entry conditions are met.
- c. Establish once through cooling.
- d. Maintain RCS at or near no load temperature until some electrical power is restored.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 80

1 Point

The following conditions exist:

- A Loss of All Feedwater occurred.
- A large void has formed in the reactor vessel.
- Feedwater was then restored.

Which one of the following describes the effect of starting the RCPs under these conditions?

- a. Pressurizer pressure and level will not change.
- b. Pressurizer pressure and level will raise.
- c. Pressurizer pressure increase and level will lower.
- d. Pressurizer pressure and level will lower.

QUESTION 81

1 Point

Which one of the following is the basis for the 2 of 4 SUR trip provided by the Nuclear Instrumentation System (NIS)?

- a. It provides protection against an uncontrolled dilution during startup at EOL.
- b. It provides protection against a large steam break accident during startup when steam generator inventory is the greatest at BOL.
- c. It limits power overshoot prior to VOPT actuation on a continuous rod withdrawal during startup.
- d. It limits power overshoot prior to VOPT actuation from a ruptured steam generator during startup.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 82

1 Point

Upon a gradual loss of instrument air pressure, at which one of the following pressures must the reactor be manually tripped?

- a. 40 psig.
- b. 50 psig.
- c. 60 psig.
- d. 70 psig.

QUESTION 83

1 Point

Which one of the following conditions would prevent the steam generator 2A feedwater regulating valve (FCV-1101) rundown following a reactor/turbine trip?

- a. Instrument air header pressure decreases to 90 psig.
- b. The Spec-200 controller for FCV-1101 has been placed in AUTO.
- c. The steam dump valve Auto/Inhibit switch has been placed in INHIBIT.
- d. Steam Generator '2A' downcomer level is low.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 84

1 Point

During a refueling outage, prior to draining the steam generators, jumpers are placed on the interposing relays on all four RPS channels. Which one of the following describes the effect that these jumpers have on RPS functions?

- a. Steam generator low downcomer level reactor trip is disabled. All other trips function normally.
- b. All reactor trips, except manual and diverse scram, are disabled.
- c. All reactor trips, except NIS generated trips, are disabled.
- d. None of the RPS generated reactor trips are affected.

QUESTION 85

1 Point

The following plant events occur:

- A plant heatup is in progress.
- Steam generator pressure is 400 psia.
- A large steam leak occurs in the turbine building.
- The MSIVs do not close.
- Both steam generators start to blow down uniformly.

Which one of the following describes the expected response of the AFW system to these events?

- a. Both AFW pumps will start when either steam generator level decreases to 32% WR.
- b. Only the motor driven AFW pump will start when either steam generator level decreases to 32% WR.
- c. Only the turbine driven AFW pump will start when both steam generator levels decrease to 32% WR.
- d. The AFW system will not respond to these events.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 86

1 Point

The power range instruments have been set in accordance with the most recent plant calorimetric heat balance calibration (XC-105). When the heat balance was performed, an error existed in the instrument used to measure feed flow. Actual feed flow was higher than measured feed flow. This will affect the degree of conservatism of the power range high power trip set point in which one of the following ways?

- a. It is unaffected.
- b. It becomes more conservative (trips at a lower power than required).
- c. It becomes less conservative (trips at a higher power than required).
- d. It depends upon flux shape and core life and cannot be predicted from this data.

QUESTION 87

1 Point

The following conditions exist:

- TCV-202 is closed.
- HCV-204 is open.
- PCV-210 is closed.

Which one of the following is the most likely cause of these conditions?

- a. High letdown temperature on TE-202.
- b. High letdown flow on FIC-212.
- c. High letdown pressure on PIC-210.
- d. Low letdown pressure on PIC-242.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 88

1 Point

The plant is operating at full power when the Extended Range Cutout Switch on Channel 'D' is inadvertently depressed. Which one of the following is a consequence of this event??

- a. There will be no effect on the nuclear instrumentation.
- b. Channel 'D' Power Range reading will decrease by approximately 10% power.
- c. Following the next shutdown, Channel 'D' will read significantly lower than the other channels.
- d. Following the next shutdown, Channel 'D' will read significantly higher than the other channels.

QUESTION 89

1 Point

The following conditions exist:

- A normal plant cooldown is in progress.
- The PPLS Block switches have been placed in the BLOCK position.
- RCS pressure is 1650 psia.
- Pressurizer pressure channel A/P-102 fails high.

Which one of the following will occur as a result of this sequence of events?

- a. Only the PPLS Block 'A' circuit would be automatically reset.
- b. Both PPLS circuits would be automatically reset but could be reblocked by operator action.
- c. Both PPLS circuits would be automatically reset and could not be reblocked.
- d. Both PPLS circuits would remain blocked.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 90

1 Point

AFAS has initiated AFW flow to both steam generators. The pressure in S/G RC-2A then falls to 100 psi less than the pressure in S/G RC-2B. Which one of the following describes the expected response of HCV-1107A and HCV-1107B to this event?

- a. Both will reclose.
- b. Both will reclose if their control switches are placed in the RESET position.
- c. HCV-1107A will reclose immediately, HCV-1107B will reclose if its control switch is placed in the RESET position.
- d. HCV-1107B will reclose immediately, HCV-1107A will reclose if its control switch is placed in the RESET position.

QUESTION 91

1 Point

The following conditions exist during an RCS cooldown:

- RCS pressure is 2000 psia.
- RCS temperature is 500°F.
- Pressurizer level is 50%.
- Two charging pumps are running.
- Four reactor coolant pumps are running.

Which one of the following actions must be taken to continue the cooldown?

- a. One reactor coolant pump must be tripped.
- b. Two reactor coolant pumps must be tripped.
- c. One charging pump must be tripped.
- d. An additional charging pump must be started.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 92

1 Point

The following conditions exist:

- A plant heatup is in progress.
- SGLS has been blocked.
- Steam generator pressure has risen to 650 psia.
- A malfunctioning steam dump then causes steam generator pressure to drop to 490 psia.

Which one of the following will occur as a result of these events?

- a. SGLS will not actuate and no other steam or feed system isolations will occur.
- b. SGLS will not actuate but the MSIVs will close on High Steam Flow.
- c. SGLS will actuate but only the MSIVs will close.
- d. SGLS will actuate and the MSIVs and Feedwater Isolation valves will close.

QUESTION 93

1 Point

A Loss of Offsite Power has occurred and the operators are conducting EOP-02 (Loss Of Offsite Power/Loss of Forced Circulation). As part of the plant depressurization they have installed Caution Tags on the HPSI Pump Switches in the Pull-To-Lock position. Which one of the following describes the reason it is necessary to remove the HPSI pumps from service at this time?

- a. Avoid HPSI pump damage due to inadequate NPSH.
- b. Avoid HPSI pump damage due to pump runout.
- c. Avoid RCS overpressurization due to inadvertent HPSI start.
- d. Avoid PORV damage due to passing cold water.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 94

1 Point

The following plant conditions exist:

- A plant startup is in progress.
- The plant is in MODE 2.
- Two Circ Water pumps are running.
- Steam dumps/Turbine bypass are controlling Tave.
- A maintenance error results in both running Circ Water pumps being stopped.

Which one of the following describes the expected response of the steam dumps and turbine bypass valves?

- a. Any open valves will close immediately.
- b. Any open valves will close when condenser vacuum degrades to 19 inches.
- c. The steam dumps will close immediately, the turbine bypass valve will close when condenser vacuum degrades to 19 inches.
- d. The turbine bypass valve will close immediately, the steam dumps will close when condenser vacuum degrades to 19 inches.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 95

1 Point

The following plant conditions exist:

- The plant is at 90% during an increase in power.
- A CEA in Control Group 4 is discovered to be at 50 inches.
- All other Group 4 CEAs are at 120 inches.
- Attempts to move the rod are unsuccessful.
- I&C investigates and reports that the drive motor for that rod has failed and will take 48 hours to repair.

Which one of the following actions is required as a result of these conditions?

- a. The power level increase and operations may continue without restriction.
- b. Power level must be maintained at or below 70% until the CEA is repaired.
- c. Power level must be maintained at or below 20% until the CEA is repaired.
- d. Verify shutdown margin and be in HOT SHUTDOWN within 5 hours.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 96

1 Point

Four individuals received the following dose equivalents for the year.

Individual	A	B	C	D
• Eff. Dose Equiv. (TEDE)	4R	1R	3R	2R
• Total Organ Dose Equiv. (TODE)	30R	18R	15R	60R
• Lens Dose Equivalent (LDE)	12R	18R	20R	10R

Which one of these individual's dose equivalent is within allowable limits per 10CFR20?

- a. A
- b. B
- c. C
- d. D

QUESTION 97

1 Point

The on-duty Shift Supervisor must be in the control room for which one of the following?

- a. During Diesel Generator Surveillance Tests.
- b. During Reactor Startup.
- c. Whenever the STA is absent from the control room.
- d. Whenever the LSC is absent from the control room.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 98

1 Point

Use of the master annunciator silence feature in the control room may be directed by which one of the following?

- a. LSO or SS.
- b. An LO or LSO.
- c. STA or SS.
- d. Any licensed operator on shift.

QUESTION 99

1 Point

Which one of the following is a potential consequence of low hydrogen concentration in the VCT?

- a. Degraded performance of the CVCS demineralizers.
- b. Increased concentration of radioactive noble gases in the VCT.
- c. Increased chlorine concentration in the RCS.
- d. Increased oxygen concentration in the RCS.

***** EXAMINATION CONTINUED ON NEXT PAGE *****

SENIOR REACTOR OPERATOR EXAMINATION

QUESTION 100

1 Point

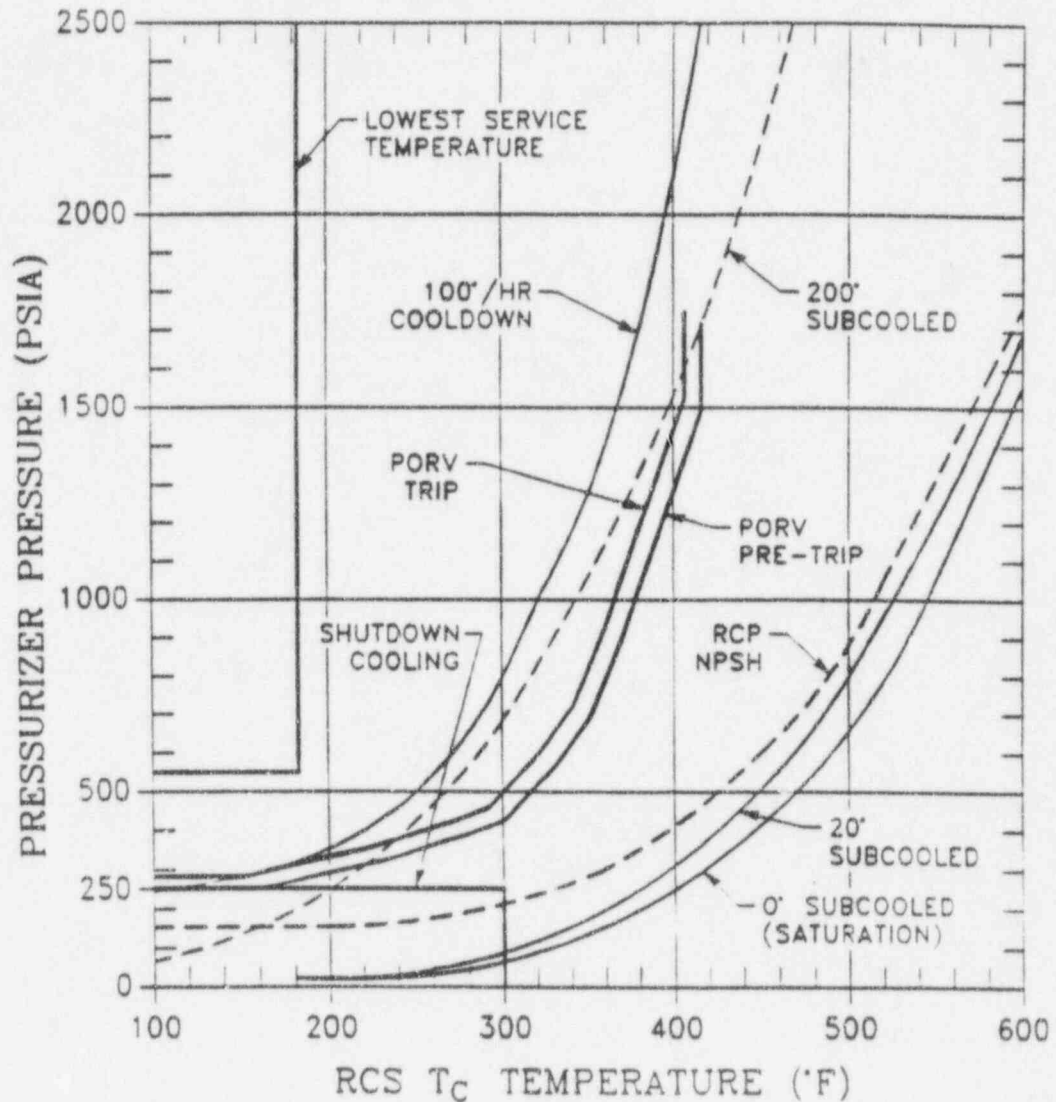
Upon declaration of an Emergency Action Level, who has the primary responsibility for dose assessment prior to activation of the TSC and EOF?

- a. Shift Chemist
- b. Shift RP Tech
- c. STA
- d. Dose assessment is not performed prior to TSC/EOF activation.

***** END OF EXAMINATION *****

Attachment 2

RCS Pressure-Temperature Limits

**NOTES**

1. This curve is only valid through 20 EFY.
2. 200°F subcooled curve supersedes 100°/HR cooldown curve anytime RCS has experienced an uncontrolled cooldown causing RCS temperature to go below 500°F.
3. To be the most conservative during forced circulation, $T_{n,}$ or during natural circulation, CETs should be used for the 20°F subcooled and the saturation curve. T_c should be used for all other curves.

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINMENT COOLING

Applicability

Applies to the operating status of the containment cooling systems.

Objective

To assure operability of equipment required to remove heat from the containment during normal operating and emergency situations.

Specifications

(1) Minimum Requirements

- * a. The reactor shall not be made critical, except for low-temperature physics tests, unless all the following are met:
 - ** 1. The following equipment normally associated with diesel-generator D1 (4.16-kV bus 1A3 and associated non-automatically transferring 480-Volt bus sections) is operable, except as noted:⁽¹⁾

Raw water pump	AC-10A
Raw water pump	AC-10C
Component cooling water pump	AC-3A
Component cooling water pump	AC-3C
Containment spray pump	SI-3A
Containment air cooling and filtering unit	VA-3A
Containment air cooling unit	VA-7C
 - ** 11. The following equipment normally associated with diesel-generator D2 (4.16-kV 1A4 and associated non-automatically transferable 480 Volt bus sections) is operable, except as noted.⁽¹⁾

Raw water pump	AC-10B
Raw water pump	AC-10D
Component cooling water pump	AC-3B
Containment spray pump	SI-3B
Containment air cooling and filtering unit	VA-3B
Containment air cooling unit	VA-7D
Containment spray pump	SI-3C
 - ** 111. All heat exchangers, valves, piping and interlocks associated with the above components and required to function during accident conditions are operable.

(1) Reactor may be made critical with one inoperable raw water pump. LCD action statements shall apply.

* SEE TSI-93-03
** SEE TSI-94-09
*** SEE TSI-95-09

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINMENT COOLING (CONTINUED)

- b. During power operating one of the components listed in (1)a.1. and 11. may be inoperable. If the inoperable component is not restored to operability within seven days, the reactor shall be placed in hot shutdown condition within 12 hours. If the inoperable component is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.
- c. For cases involving Raw Water pump inoperability, if the river water temperature is below 60 degrees Fahrenheit, one Raw Water pump may be inoperable indefinitely without applying any LCO action statement. When the river water temperature is greater than 60 degrees Fahrenheit, an inoperable Raw Water pump shall be restored to operability within 7 days or the reactor shall be placed in a hot shutdown condition within 12 hours. If the inoperable Raw Water pump is not restored to operability within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

(2) Modification of Minimum Requirements

During power operation, the minimum requirements may be modified to allow a total of two of the component listed in (1)a.1. and 11. to be inoperable at any one time (this does not include one Raw Water pump which may be inoperable as described above if the river water temperature is below 60 degrees Fahrenheit). Only two raw water pumps may be out of service during power operations. If the operability of one component is not restored within 24 hours, the reactor shall be placed in a hot shutdown condition within 12 hours. LCO 2.4(1)b. shall be applied if one of the inoperable components is restored within 24 hours. If the operability of both components is not restored within an additional 48 hours, the reactor shall be placed in a cold shutdown condition within 24 hours.

Any valves, interlocks and piping directly associated with one of the above components and required to function during accident conditions shall be deemed to be part of that component and shall meet the same requirements as for that component.

Any valve, interlock or piping associated with the containment cooling system which is not included in the above paragraph and which is required to function during accident conditions

2.0 LIMITING CONDITIONS FOR OPERATION

2.4 CONTAINMENT COOLING (CONTINUED)

may be inoperable for a period of no more than 24 hours.
If operability is not restored within 24 hours, the reactor
shall be placed in a hot shutdown condition within 12 hours.

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems

Applicability

Applies to the availability of electrical power for the operation of plant components.

Objective

To define those conditions of electrical power availability necessary to provide for safe reactor operation and the continuing availability of engineered safety features.

Specifications

(1) Minimum Requirements

The reactor shall not be heated up or maintained at temperatures above 300°F unless the following electrical systems are operable:

- a. Unit auxiliary power transformers TIA-1 or -2 (4,160 V).
- b. House service transformers TIA-3 and 4 (4,160 V).
- c. 4,160 V engineered safety feature buses 1A3 and 1A4.
- d. 4,160 V/480 V Transformers TIB-3A, TIB-3B, TIB-3C, TIB-4A, TIB-4B, TIB-4C.
- e. 480 V distribution buses 1B3A, 1B3A-4A, 1B4A, 1B3B, 1B3B-4B, 1B4B, 1B3C, 1B3C-4C, 1B4C.
- f. MCC No. 3A1, 3B1, 3A2, 3C1, 3C2, 4A1, 4A2, 4C1 and 4C2.
- g. 125 V d-c buses No. 1 and 2 (Panels EE-8F and EE-8G).
- h. 125 V d-c distribution panels AI-41A and AI-41B.
- i. 120V a-c instrument buses A, B, C, and D (Panels AI-40-A, B, C and D).
- * j. 120V a-c instrument panels AI-42A and AI-42B.
- k. Station batteries No. 1 and 2 (EE-8A and EE-8B) including one battery charger on each 125V d-c bus No. 1 and 2 (EE-8F and EE-8G).
- l. Two emergency diesel generators (DG-1 and DG-2).
- m. One diesel fuel storage system containing a minimum volume of 16,000 gallons of diesel fuel in FO-1, and an additional 8,000 gallons of diesel fuel in FO-10.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

(2) Modification of Minimum Requirements

The minimum requirements may be modified to the extent that one of the following conditions will be allowed after the reactor coolant has been heated above 300°F. However, the reactor shall not be made critical unless all minimum requirements are met. If any of the provisions of these exceptions are violated, the reactor shall be placed in a hot shutdown condition within the following 12 hours. If the violation is not corrected within an additional 12 hours, the reactor shall be placed in a cold shutdown condition within an additional 24 hours.

- a. Both unit auxiliary power transformers T1A-1 and -2 (4.16 kV) may be inoperable for up to 24 hours provided the operability of both diesel generators is demonstrated immediately.
- b. Either house service transformer T1A-3 or T1A-4 (4.16kV) may be inoperable for up to 7 days provided the operability of the diesel generator associated with the inoperable transformer is immediately verified. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 7 days is permissible, provided a special report is submitted to the NRC within 48 hours after transformer inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of transformer operability and the additional precautions to be taken while the transformer is out of service.
- c. Both house service transformers T1A-3 and T1A-4 (4.16kV) may be inoperable for up to 72 hours provided the operability of both diesel generators is immediately verified. The loss of the 161kV incoming line renders both transformers inoperable. The NRC Operations Center shall be notified by telephone within 4 hours after transformer inoperability. Continued operation beyond 72 hours is permissible, provided a special report is submitted to the NRC within 48 hours after both transformers' inoperability pursuant to Section 5.9.3 of the Technical Specifications. The special report will outline the plans for restoration of the transformers' operability and the additional precautions to be taken while the transformers are out of service.

2.0 LIMITING CONDITIONS FOR OPERATION
2.7 Electrical Systems (Continued)

- d. Either one of the 4.16kV engineered safeguards buses, 1A3 or 1A4 may be inoperable for up to 8 hours provided the operability of the diesel generator associated with the operable bus is demonstrated immediately and there are no inoperable required engineered safeguards components associated with the operable bus.
- e. One of each group of 4160 V/480 V Transformers (T1B-3A or 4A), (T1B-3B or 4B), and (T1B-3C or 4C) may be inoperable for up to 8 hours provided there are no inoperable required engineered safeguards components which are redundant to components on the inoperable transformer.
- f. One of the 480 V distribution buses connected to bus 1A3 or connected to bus 1A4 may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus.
- g. Either Group of MCC No.'s (3A1, 3B1, 3A2, 3C1, 3C2,) or (4A1, 4A2, 4C1, 4C2) may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable MCC. MCC 3C1 may be inoperable in excess of 8 hours if battery chargers No. 1 and No. 2 are operable.
- h. One of the four 120V a-c instrument buses (A, B, C or D) may be inoperable for 8 hours provided the reactor protective and engineered safeguards systems instrument channels supplied by the remaining three buses are all operable.
- i. Two battery chargers may be inoperable for up to 8 hours provided battery charger No. 1 (EE-8C) or No. 2 (EE-8D) is operable.
- *
**
*** j. Either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to seven days (total for both) during any month, provided there are no inoperable required engineered safeguards components associated with the operable diesel generator. If one diesel generator is inoperable, within 8 hours (regardless of when the inoperable diesel generator is restored to operability) EITHER:
 - (1) Start the other diesel generator to verify operability, OR
 - (2) Ensure the absence of common cause for the diesel generator inoperability for the other diesel generator.
- k. If inventory of diesel fuel in FO-1 is less than 16,000 gallons and/or FO-10 is less than 8,000 gallons, but the combined inventory in FO-1 and FO-10 is greater than a 6 day supply (21,350 gallons), then restore the required inventory within 48 hours.

* See TSI-92-13
** See TSI-94-06
*** See TSI-92-03

2.0 LIMITING CONDITIONS FOR OPERATION

2.7 Electrical Systems (Continued)

- l. Island buses 1B3A-4A, 1B3B-4B, and 1B3C-4C may be inoperable for up to 8 hours provided there are no inoperable required safeguards components which are redundant to components on the inoperable bus(es).
- m. Either one of the 125V d-c buses No. 1 or 2 (Panels EE-8F or EE-8G) may be inoperable for up to 8 hours.
- n. Either one of the 125V d-c distribution panels AI-41A or AI-41B may be inoperable for up to 8 hours.
- o. Either one of the 120V a-c instrument panels AI-42A or AI-42B may be inoperable for up to 8 hours.

APPENDIX B
TECHNICAL SPECIFICATION INTERPRETATION

TSI- 92-13

TECHNICAL SPECIFICATION REFERENCE: 2.7
TECHNICAL SPECIFICATION PAGE NO.: 2-34
PARAGRAPH/TABLE/ITEM: 2.7(2)i.

INTERPRETATION:

Technical Specification states, "either one of the emergency diesel generators (DG-1 or DG-2) may be inoperable for up to 7 days (total for both) during any month...." "During any month" is interpreted to mean during any calendar month. The 7 day LCO clock restarts with the beginning of a new month. This is not, however, to be construed as allowing any single diesel outage to exceed 7 days by overlapping outage time at the end of one month with the outage time allowed for a new month.

BASES:

Question was posed to NRC Project Manager, Wayne Walker, who conferred on this issue with NRC-NRR. The NRC is in agreement with this interpretation provided that the 7 day overall limit is not exceeded.

PRC RECOMMENDS
APPROVAL

OCT 15 1992

PRC MTG. MINUTES

REFERENCES:

T: 1

6. CONCURRENCE: [Signature] DATE: 10-1-92
 Manager - NL&IA
7. APPROVED: [Signature] DATE: 10-15-92
 Chairman - PRC

Figure II.A.4
Cycle 16 Inverse Boron Worth vs Burnup

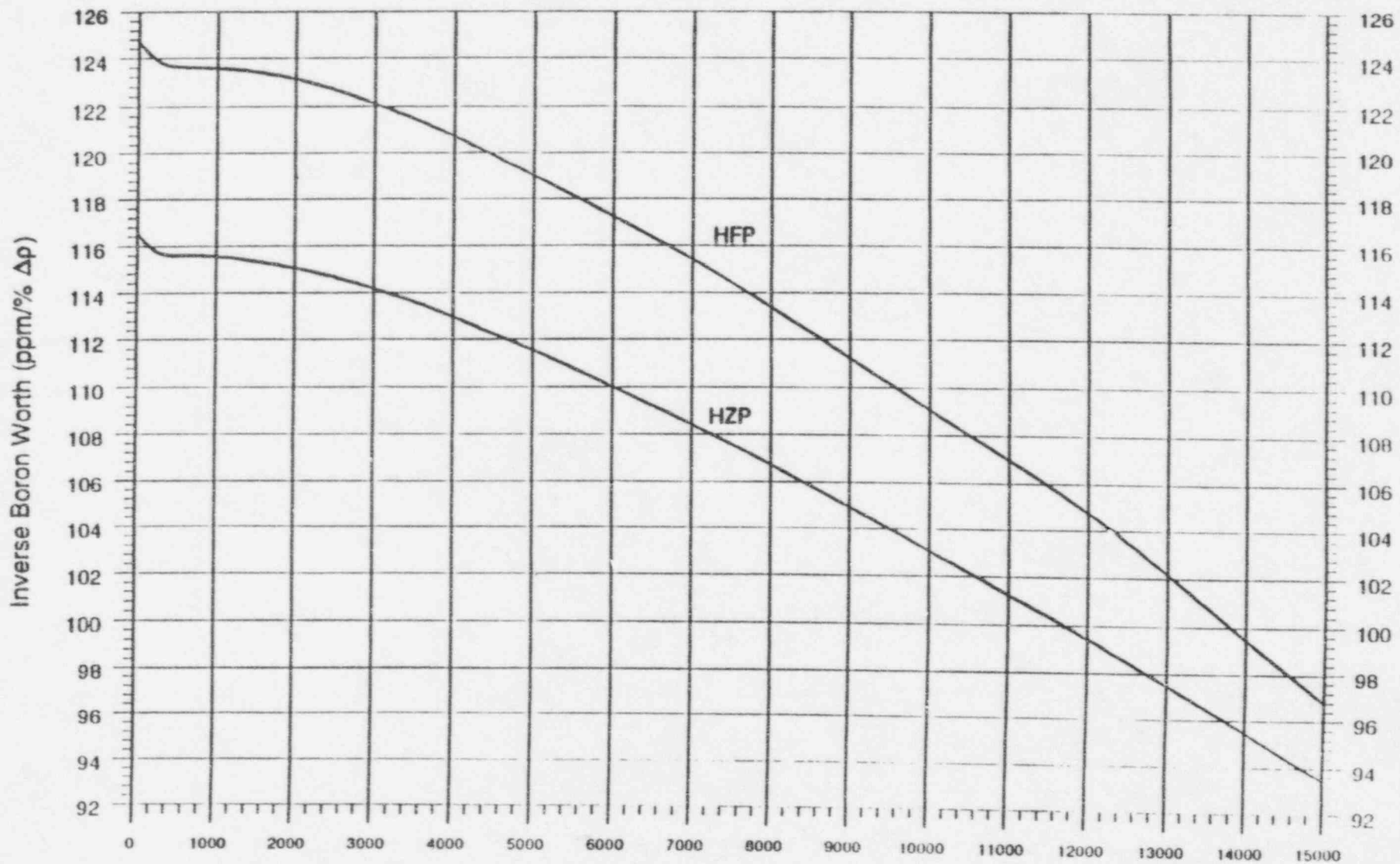
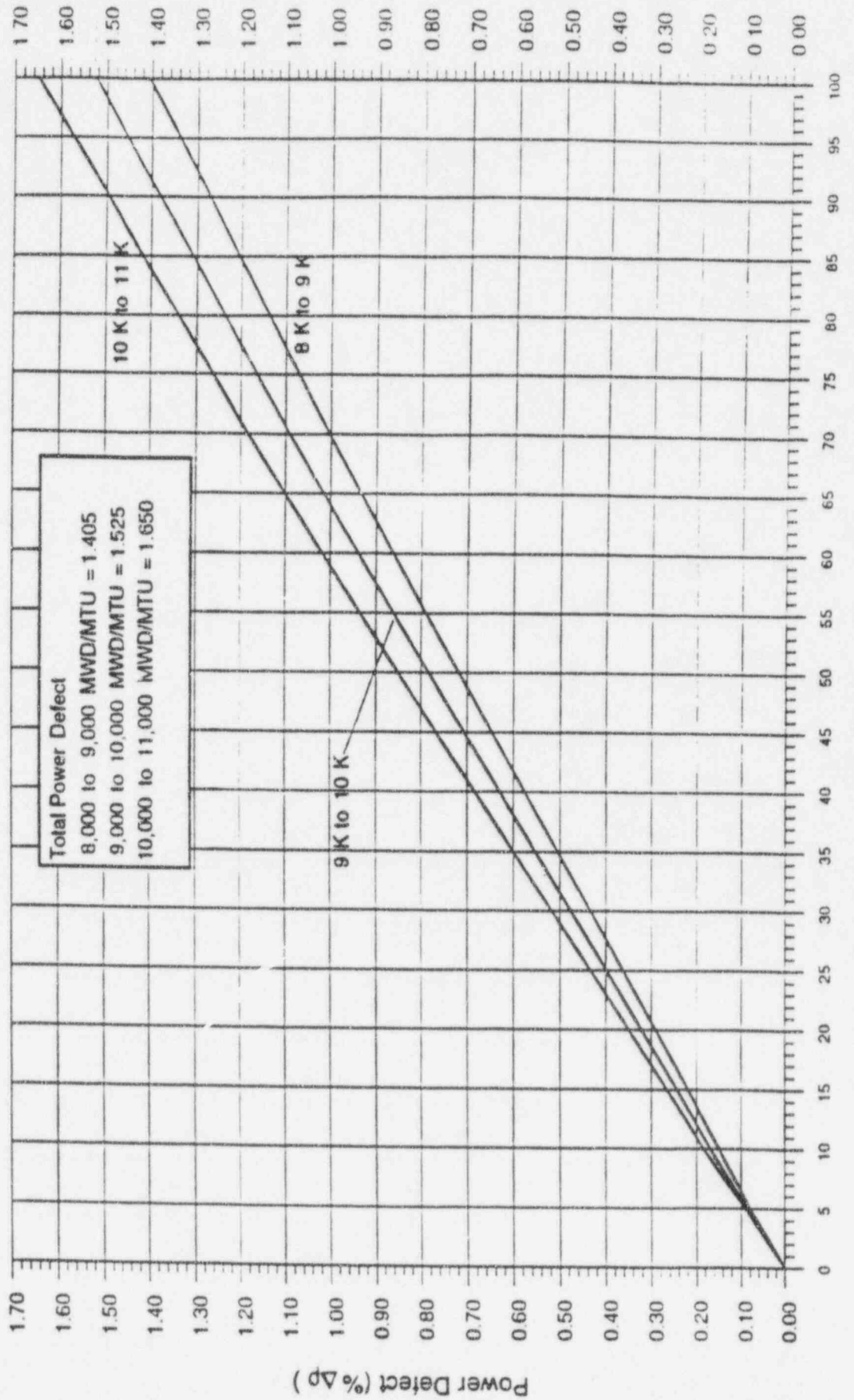


Figure II.C.2.b
Cycle 16 Total Power Defect vs Power
 (8,000 to 11,000 MWD/MTU)



Attachment B

Time to Boil Determination Worksheet

1. Time Shutdown Cooling was lost: _____
2. Last known RCS/SDCS temperature: _____ °F
from instrument number: _____
3. Record the following information and inform the Shift Supervisor on 10 minute intervals

TIME	CET/HJTC °F	HEATUP RATE	TIME TO BOIL

Alternate Method: $T_b = T_a + T_o - T_c$
 Where T_b is the remaining time to boil
 T_a is the approximate time to boil from the appropriate curve
 T_o is the time SDC was lost
 T_c is the current time

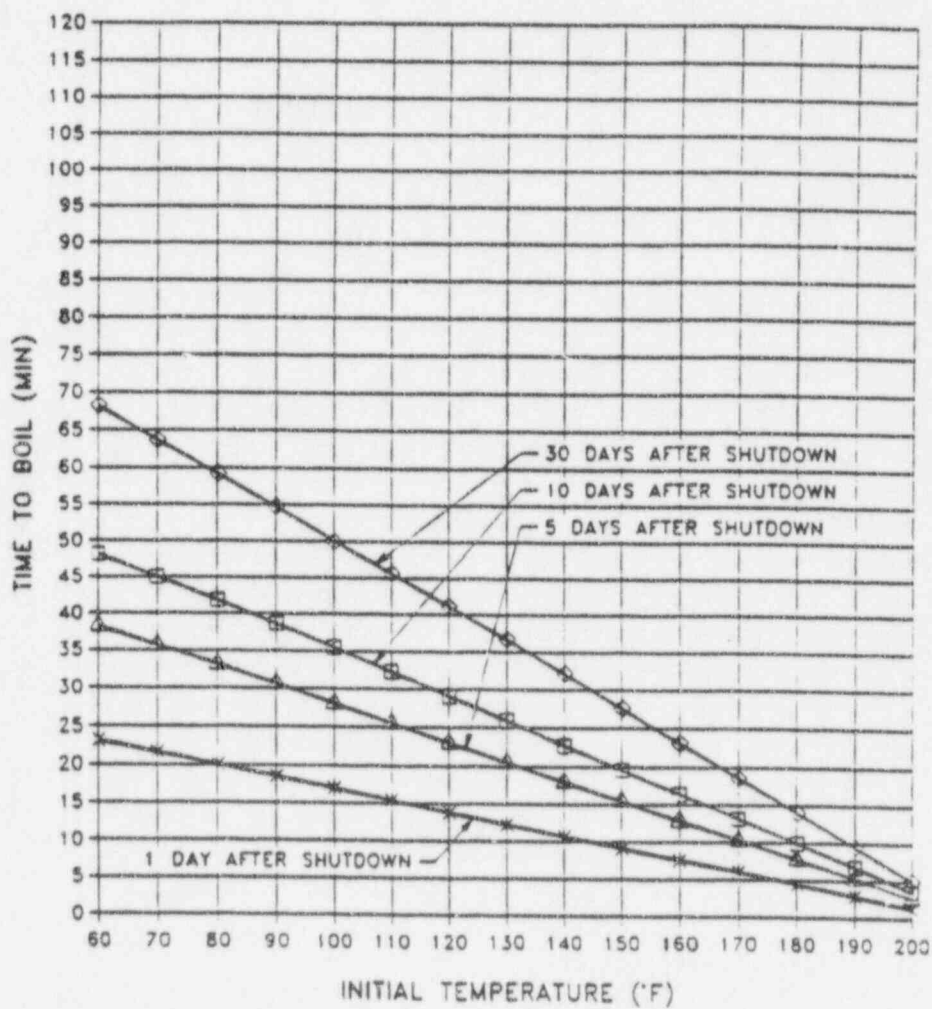
Attachment B

Time to Boil Determination

Time to Boil (RCS at Mid Loop)

APPROXIMATE TIME TO BOIL

RCS AT MID LOOP CONDITIONS



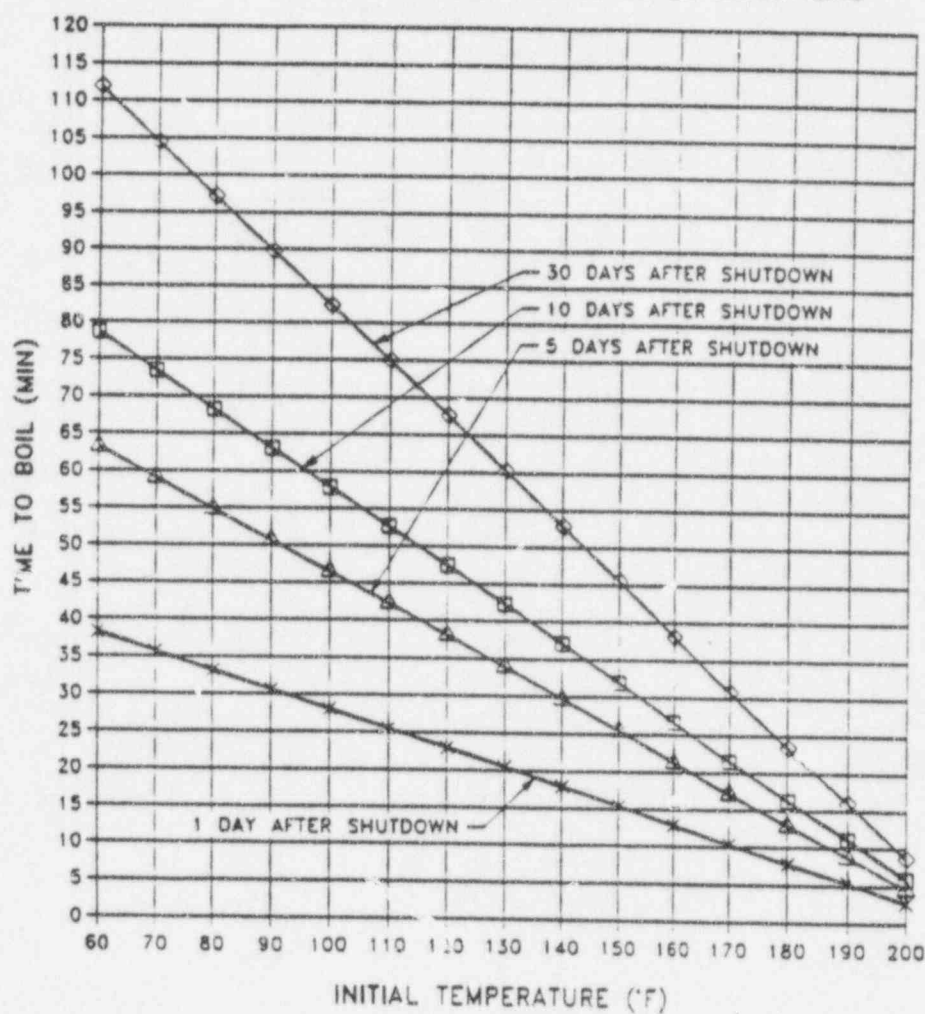
Attachment B

Time to Boil Determination

Time to Boil (RCS at Reactor Vessel Flange)

APPROXIMATE TIME TO BOIL

RCS AT REACTOR VESSEL FLANGE LEVEL CONDITIONS



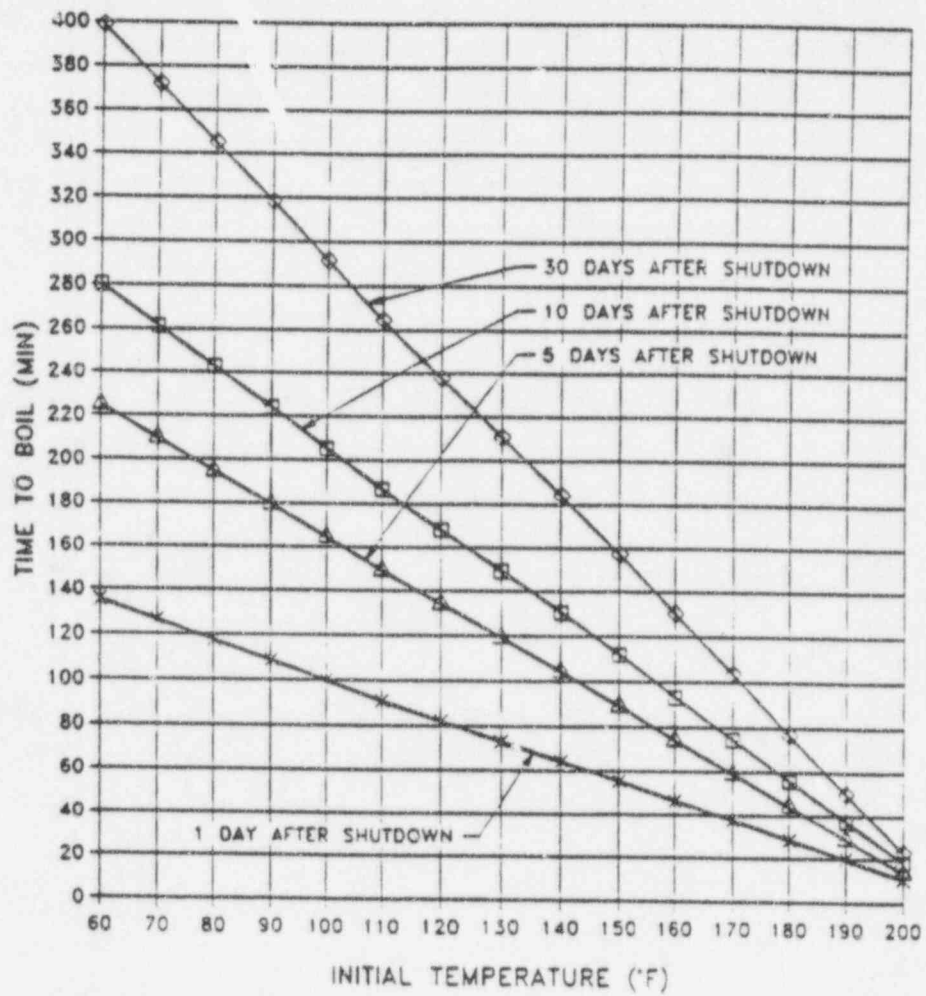
Attachment B

Time to Boil Determination

Time to Boil (RCS at Normal Operating Volume)

APPROXIMATE TIME TO BOIL

RCS AT NORMAL OPERATING LIMITS



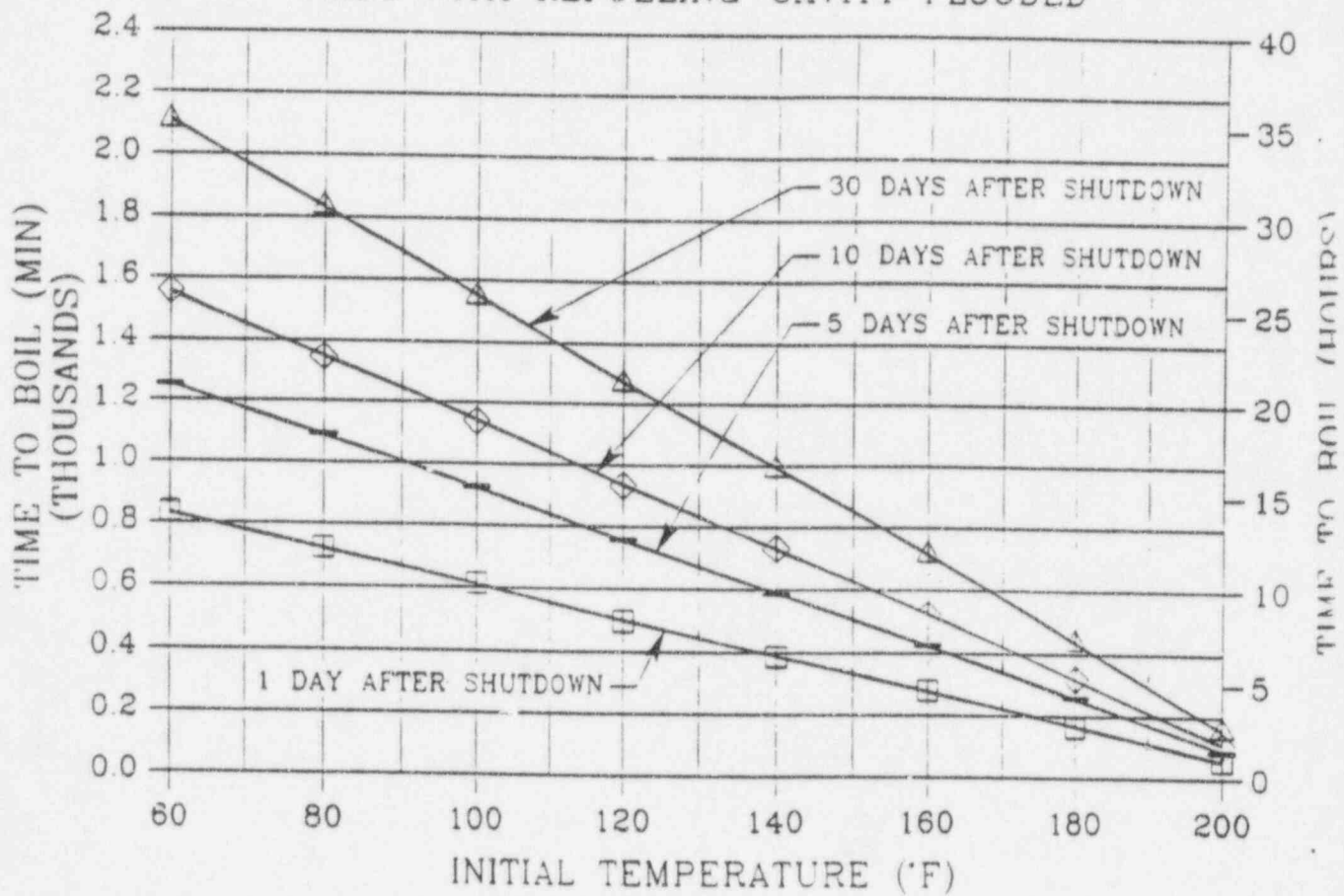
Attachment B

Time to Boil Determination

Time to Boil (Refueling Cavity Flooded)

APPROXIMATE TIME TO BOIL

RCS WITH REFUELING CAVITY FLOODED



End of Attachment B

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits

Applicability

Applies to operation of control element assemblies and monitoring of selected core parameters whenever the reactor is in cold or hot shutdown, hot standby, or power operation conditions.

Objective

To ensure (1) adequate shutdown margin following a reactor trip, (2) the MTC is within the limits of the safety analysis, and (3) control element assembly operation is within the limits of the setpoint safety analysis.

Specification

(1) Shutdown Margin With $T_{\text{mod}} > 210^{\circ}\text{F}$

Whenever the reactor is in hot shutdown, hot standby or power operation conditions, shutdown margin shall be $\geq 4.0\% \Delta k/k$. With the shutdown margin $< 4.0\% \Delta k/k$, initiate and continue boronation until the required shutdown margin is achieved.

(2) Shutdown Margin With $T_{\text{mod}} \leq 210^{\circ}\text{F}$

Whenever the reactor is in cold shutdown conditions, the shutdown margin shall be $\geq 3.0\% \Delta k/k$. With the shutdown margin $< 3.0\% \Delta k/k$, initiate and continue boronation until the required shutdown margin is achieved.

(3) Moderator Temperature Coefficient

The moderator temperature coefficient (MTC) shall be:

- a. Less positive than $+0.2 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties for power levels at or above 80% of rated power.
- b. Less positive than $+0.5 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties for power levels below 80% of rated power.
- c. More positive than $-3.0 \times 10^{-4} \Delta\rho/^{\circ}\text{F}$ including uncertainties at rated power.

With the moderator temperature coefficient confirmed outside any one of above limits, change reactivity control parameters to bring the extrapolated MTC value within the above limits within 3 hours or be in at least hot shutdown within 6 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

Control Element Assemblies

* (4) Full Length CEA Position During Power Operation

All full length (shutdown and regulating) CEA's shall be operable with each CEA of a given group positioned within 12 inches (actual position) of all other CEA's in its group. If one or more of the CEA's is inoperable or misaligned, determine the cause and comply with one of the following:

- a. If one or more full length CEA's are inoperable due to: 1) being immovable as a result of excessive friction or mechanical interference, or 2) known to be untrippable, determine that the shutdown margin requirement of Specification 2.10.2(1) is satisfied within 1 hour and be in at least hot shutdown within 7 hours.
- b. With one full length CEA inoperable due to causes other than addressed in item a. above, and inserted beyond the Long Term Steady State Insertion Limits but within its above specified alignment requirements, power operation may continue for up to 7 EFPD's per occurrence with a total accumulated time of < 14 EFPD per fuel cycle.
- c. With one full length CEA inoperable due to causes other than addressed in item a. above, but within its above specified alignment requirements and either fully withdrawn or above the Long Term Steady State Insertion Limits if in CEA group 4, power operation may continue.
- d. With one or more full length CEA's misaligned from any other CEA's in its group by more than 12 inches but less than 18 inches (actual position) within one hour either:
 - (i) Restore the misaligned CEA(s) to within 12 inches (actual position) of any other CEA's in its own group (realignment shall be made while maintaining the allowable CEA sequence and CEA insertion limits of the Power Dependent Insertion Limits Figure provided in the COLR; or
 - (ii) Declare the CEA's inoperable. Power operation may continue provided all of the following conditions are met:
 1. The power level shall be reduced to $\leq 70\%$ of the maximum allowable power level for the existing Reactor Coolant Pump combination within an additional one hour; if negative reactivity insertion is required to reduce power, boration shall be used.

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

2. Within one hour after reducing the power as required by 1., above, the remainder of the CEA's in the group with the inoperable CEA shall be aligned to within 12 inches (actual position) of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits for Power Dependent Insertion Limit Figure provided in the COLR, the power level shall be restricted pursuant to the applicable section of b. or c. above during subsequent operation.

or (iii) Be in hot shutdown within the next 6 hours.

e. With one full length CEA misaligned from any other CEA's in its group by 18 inches or more (actual position), reduce power to $\leq 70\%$ of the maximum allowable power level for the existing Reactor Coolant Pump combination within one hour. If negative reactivity insertion is required to reduce power, boration shall be used. Within one hour after reducing power as required above, either:

(i) Restore the CEA(s) to within 12 inches (actual position) of any other CEA's in its group (realignment shall be made while maintaining the allowable CEA sequence and CEA insertion limits of the Power Dependent Insertion Limit Figure in the COLR); or

(ii) Declare the CEA(s) inoperable and determine that the shutdown margin requirement of Specification 2.10.2(1) is satisfied and align the remainder of the CEA's in the group with the inoperable CEA to within 12 inches (actual position) of the inoperable CEA while maintaining the allowable CEA sequence and insertion limits shown in the Power Dependent Insertion Limit Figure provided in the COLR. The shutdown margin requirement of Specification 2.10.2(1) shall be determined at least once per shift. The power level shall be restricted pursuant to the applicable section of b. or c. above during subsequent operation; or

(iii) Be in hot shutdown within an additional 5 hours.

f. With more than one full length CEA inoperable or misaligned from any other CEA in its group by 18 inches (actual position) or more, be in at least hot shutdown within 7 hours.

2.0 LIMITING CONDITIONS FOR OPERATION
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

(5) Non-trippable CEA Position During Power Operation

All non-trippable CEA's (NTCEA) shall be withdrawn to at least 114 inches (actual position). If one or more NTCEA's becomes misaligned from other NTCEA's by more than 12 inches (actual position) either:

- a. Restore the NTCEA to within the specified alignment requirements within one hour, or
- b. Be in at least hot shutdown within an additional 6 hours.

(6) Shutdown CEA Insertion Limit During Power Operation

All shutdown CEA's shall be withdrawn to at least 114 inches as a condition for reactor criticality, or with one or more shutdown CEA's inserted to more than 114 inches withdrawn, except for surveillance testing, within one hour, either:

- a. Withdraw the CEA's to at least 114 inches, or
- b. Declare the CEA's inoperable and apply Specification 2.10.2(4).

(7) Regulating CEA Insertion Limits During Hot Standby and Power Operation

The regulating CEA groups shall be positioned within the acceptable operating range for regulating rod position of the Power Dependent Insertion Limits Figure provided in the COLR except during CEA exercises above 114 inches. With all CEA's operable, CEA insertion beyond the Long Term Insertion Limits is restricted to:

1. 4 hours per 24 hour interval,
 2. 4 EFPD per 30 EFPD interval, and
 3. 14 EFPD per fuel cycle.
- a. When the regulating CEA groups are inserted beyond the Transient Insertion Limits within two hours, either:
 - (i) Restore the regulating CEA groups to above the Transient Insertion Limits, or
 - (ii) Reduce reactor power to the allowed power of the Power Dependent Insertion Limit Figure of the COLR which permits continued operation above the Transient Insertion Limit using the existing CEA group position.

2.0 LIMITING CONDITIONS FOR OPERATION
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

- b. When the regulating CEA groups are inserted beyond the Long Term Insertion Limit for a time interval in excess of 4 hours per 24 hour interval, operation may proceed deleting this daily restriction, provided either:
- (i) Regulating CEA groups are not inserted below the Short Term Insertion Limit, or
 - (ii) Regulating CEA groups are not inserted below the Transient Insertion Limit and rates of power increases initiated when the regulating CEA's are inserted below the Short Term Insertion Limit are less than 5%/hour.
- c. When the regulating CEA groups are inserted below the Long Term Insertion Limit for time intervals in excess of 4 EFPD per 30 EFPD interval and 14 EFPD per fuel cycle, either:
- (i) Restore the regulating groups to within the Long Term Insertion Limit within two hours, or
 - (ii) Be in hot shutdown within 6 hours.

(8) CEA Drop Time

The individual full length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be ≤ 2.5 seconds from the time the clutch coil is de-energized until the CEA reaches its 90 percent insertion position with:

- a. $T_{\text{cool}} \geq 515^{\circ}\text{F}$, and
- b. All reactor coolant pumps operating.

With the drop time of any full length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to hot standby or power operation.

(9) Test Exemption

a. CEA Insertion Limits and Misalignment

- (i) The insertion limits of Specification 2.10.2 may be suspended during the performance of physics tests provided:

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

1. The power is restricted to the test power plateau which shall not exceed (85%) of rated power, and
 2. The power shall be determined at least once per hour during physics tests.
 3. The linear heat rate shall be determined to be within the limits of Specification 2.10.4(1) by monitoring it continuously with the Incore Detector Monitoring System during physics tests above 5% of rated power.
- (ii) The alignment requirements of Specification 2.10.2(4) and insertion limits of Specification 2.10.2(7) may be suspended during the performance of physics tests to determine the isothermal temperature coefficient and power coefficient provided:
1. Only the center CEA (CEA 4-1) is misaligned, and
 2. The linear heat rate shall be determined to be within the limits of Specification 2.10.4(1) by monitoring it continuously with the Incore Detector Monitoring System during physics test above 5% of rated power.
- (iii) With any of the limits of Specification 2.10.4(1) being exceeded while the requirements of Specification 2.10.2(4), (5), (6), and (7) are suspended, either:
1. Reduce power sufficiently to satisfy the requirements of Specification 2.10.4(1), or
 2. Be in hot shutdown within 6 hours.

b. Shutdown Margin

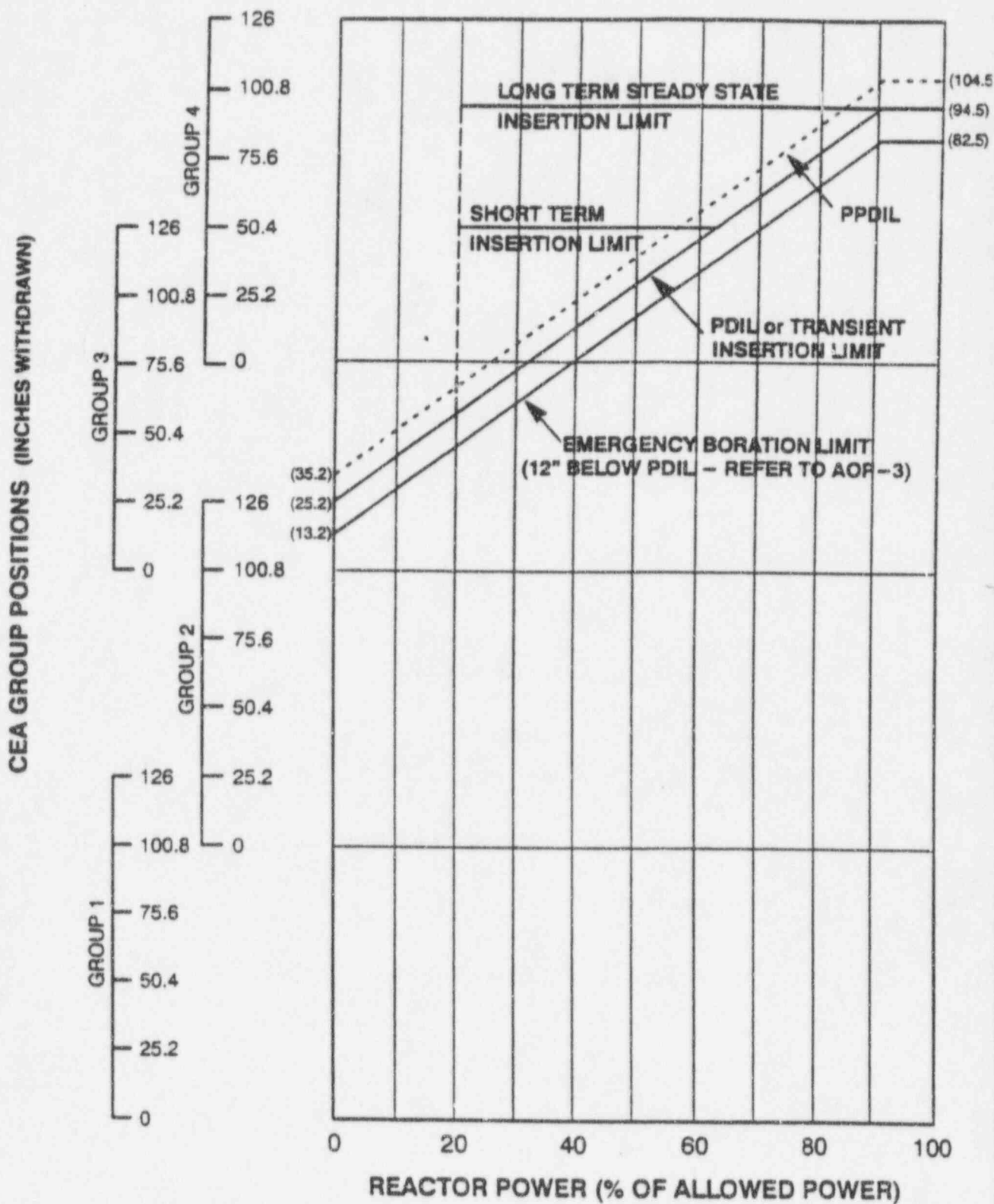
- (i) The shutdown margin required by 2.10.2(1) may be reduced during physics testing at power levels less than 10⁻¹% of rated power for measurement of CEA worth and shutdown margin provided that:
1. Reactivity equivalent to at least the highest estimated CEA worth is available from the operable CEA groups withdrawn (assuming the most reactive CEA of the groups withdrawn is stuck in the fully withdrawn position), and

2.0 LIMITING CONDITIONS FOR OPERATION

2.10 Reactor Core (Continued)

2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

2. The position of each trippable CEA required shall be determined at least once per 2 hours, and
 3. Each CEA not fully inserted shall be demonstrated capable of full insertion when tripped from at least the 50% withdrawn position within 7 days prior to reducing the Shutdown Margin to less than the limits of Specification 2.10.2(1).
 - (ii) If the shutdown margin specified in part (i) above is not available, immediately initiate and continue boration until the requirements of 2.10.2(1) are met.
 - (iii) The shutdown margin specified in part (i) above shall be verified every 8 hour shift.
- c. Moderator Temperature Coefficient
- (i) The moderator temperature coefficient (MTC) requirements of 2.10.2(3) may be suspended during physics tests at less than 10^{-1} % of rated power.
 - (ii) If power exceeds 10^{-1} % of rated power, either:
 1. Reduce power to less than 10^{-1} % of rated power within 15 minutes, or
 2. Be in hot shutdown in 2 hours.



CYCLE 16 COLR	POWER DEPENDENT INSERTION LIMIT	FIGURE 2
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