U. S. NUCLEAR REGULATORY COMMISSION

REGION 1

Docket Nos:	50-272, 50-311
Report Nos:	50-272/99-301, 50-311/99-301
License Nos:	DPR-70, DPR-75
Licensee:	Public Service Electric and Gas Company
Facility:	Salem Units 1 and 2
Location:	Hancock's Bridge, NJ
Dates:	February 22 - March 5, 1999 (Operating and Written Test Administration) March 8 -12, 1999 (Grading)
Chief Examiner:	P. Bissett, Senior Operations Engineer/Examiner
Examiners:	D. Silk, Senior Operations Engineer/Examiner T. Fish, Operations Engineer/Examiner
Approved By:	Richard J. Conte, Chief Human Performance & Emergency Preparedness Branch Division of Reactor Safety

EXECUTIVE SUMMARY

Salem Nuclear Facility Units 1 and 2
Inspection Report Nos. 50-272/99-301 and 50-311/99-301

Operations

Eight reactor operator (RO) and eight instant senior reactor operator (SRO) applicants were administered initial licensing exams. Seven of the eight RO applicants and all eight SRO applicants successfully passed all portions of the exam. One RO applicant failed the written portion of the examination.

The applicants performed well on the operating portions of the exam. Performance was very consistent between, not only individuals, but crews alike. The applicants consistently demonstrated formal communications and teamwork during the simulator scenarios in both the routine and emergency conditions. Referral to abnormal operating procedures occurred on a routine basis during any abnormal plant operating condition. The applicants consistently demonstrated self-checking practices. Crew briefings were concise and to the point, however, the timing, in some instances, resulted in short delays in implementing recovery actions.

The as-submitted written examination was of acceptable quality overall. Enhancements were made and one question had to be replaced.

All job performance measures (JPMs) and simulator scenarios were properly validated before the NRC staff review. The proposed simulator scenarios and JPMs were acceptable, with one in-plant JPM being replaced due to an inability to open an electrical breaker cabinet. Not being permitted to open the cabinet was conservative decision making on part of the operations department as a result of a change in plant conditions from those during the validation period.

Report Details

I. Operations

03 Operations Procedures and Documentation

As a result of the examiners review of material developed or used in the administration of the initial examination process, the examiners observed implementation and related adequacy of Salem facility procedures. No problems were noted during the development or administration of the examinations.

05 Operator Training and Qualifications

05.1 Reactor Operator (RO) and Senior Reactor Operator (SRO) Initial Exams

a. Scope

The NRC examiners reviewed the written and operating initial examinations submitted by the Salem staff to ensure that they were prepared and developed in accordance with the guidelines of Interim Revision 8 of NUREG-1021, "Operator Licensing Exam Standards for Power Reactors." The review was conducted both in the Region 1 office and at the Salem facility. Final resolution of comments and test revisions was conducted during the onsite preparation week. From February 22 - March 5, 1999, the NRC examiners administered the operating portion of the exam to all applicants. On February 26, 1999, the written exams were administered by Salem's training organization, with NRC oversight.

b. Observations and Findings

Grading and Results

The results of the exams are summarized below:

	SRO Pass/Fail	RO Pass/Fail	Total Pass/Fail
Written	8/0	7/1	15/1
Operating	8/0	8/0	16/0
Overall	8/0	7/1	15/1

Attachment 1 reflects the NRC staff resolution of facility post-examination comments in Attachment 2. Six formal comments were submitted by the Salem training facility subsequent to the exam concerning the written examination content. Five of the six comments dealt with questions having more than one correct answer and one comment revealed that the answer key was incorrect. For five questions, alternate answers were accepted. The sixth question, based upon NRC review, was deleted, which resulted in the RO exam consisting of 99 questions.

Examination Preparation and Quality

The written exams, job performance measures (JPMs) and simulator scenarios were developed by Salem and their contractor representatives. The exam development team was comprised of Salem training and operations representatives. All individuals signed a security agreement once the development of the exam commenced. The NRC subsequently reviewed and validated all portions of the proposed exams. Several changes and/or additions to the proposed exams were requested by the NRC during the onsite review. Salem personnel subsequently incorporated the agreed to comments and finalized the exams.

The NRC review of the written examination resulted in the replacement of one question because it did not pertain to an operationally related task. Approximately 25 changes were also made to question stems to make the question clearer in soliciting the correct answer and to distractors to ensure they were plausible, but incorrect.

During the preparation week, one in-plant JPM was replaced because it could not be adequately simulated in the plant, due to the inability to open some electrical breaker cabinet doors. The JPM had previously been validated, however, under different plant conditions. The assumption had been made that the door could be opened, however, upon checking with the operations department for authorization, the decision was made not to allow entry to prevent the possible inadvertent actuation of safeguards equipment.

Written Test Administration and Performance

The RO and SRO written exams and answer keys are in Attachments 3 and 4, respectively.

The Salem training department performed an analysis of questions missed on the written exam for generic and individual weaknesses. For feedback to the initial licensed operator training program, the examiners noted, as did the facility, that the following questions were missed by at least half of the applicants.

Question #	Question Topic
#2RO	Knowledge of control room log review responsibilities.
#3SRO/#4RO	Knowledge of actions to be taken for correcting control room logs.
#16SRO	Knowledge of monitoring frequency for Critical Safety Function Status Trees.
#38RO	Knowledge of how core exit thermocouple readings are affected by temperature changes in the area of the reference junction boxes.
#49RO	Ability to predict the response of the EHC controls as a result of an impulse pressure channel failure.

#62SRO/67RO	Basis for stopping a depressurization following a LOCA when pressurizer level reaches 33%.
#88SRO	Knowledge of the status of the alternate sources to the Salem fire water header.

Operating Test Administration and Performance

The operating test consisted of the performance of ten JPMs and three scenario exercises for all RO and instant SRO applicants. Each SRO applicant performed twice at the control room supervisor position and once at the reactor operator position. Each RO applicant performed one scenario at the reactor operator position and two scenarios at the balance-of-plant position.

The applicants consistently demonstrated formal communications and teamwork during the simulator exercises in both the routine and emergency portions of the exercise. Referral to abnormal operating procedures occurred on a routine basis during any abnormal plant operating condition. Crew briefings were routinely called for by the applicants when in the control room supervisor (CRS) position. The briefings were well structured and ensured that all crew members knew the status of the equipment under their control. It was noted that the briefings primarily involved the reactor operator and balance-of-plant operator briefing the CRS as to the status of their equipment. On a couple of instances, the timing of the briefings was during degrading plant conditions. The examiners concluded that, in these instances, recovery actions were delayed somewhat, but without significant consequences. Control board awareness by all of the applicants was evident throughout each of the scenarios observed by the NRC examiners. Self-checking practices, utilizing STAR (Stop, Think, Act, Review) techniques, were consistently applied.

Each applicant was also given an administrative exam, as part of the operating test, which consisted of administrative questions and JPMs. Several of the RO applicants experienced difficulty during the performance of one JPM that dealt with a change to a surveillance procedure utilizing the On-The-Spot-Change process.

c. Conclusions

Eight RO and eight instant SRO applicants were administered initial licensing exams. Seven of the eight RO applicants and all eight SRO applicants successfully passed all portions of the exam. One RO applicant failed the written portion of the examination.

The applicants performed well on the operating portions of the exam. Performance was very consistent between, not only individuals, but crews alike. The applicants consistently demonstrated formal communications and teamwork during the simulator scenarios in both the routine and emergency conditions. Referral to abnormal operating procedures occurred on a routine basis during any abnormal plant operating condition. The applicants consistently demonstrated self-checking practices. Crew briefings were concise and to the point, however, the timing, in some instances, resulted in short delays in implementing recovery actions.

The as-submitted written examination was of acceptable quality overall. Enhancements were made and one question had to be replaced.

All JPMs and simulator scenarios were properly validated before the NRC staff review. The proposed simulator scenarios and JPMs were acceptable, with one in-plant JPM being replaced due to an inability to open an electrical breaker cabinet. Not being permitted to open the cabinet was conservative decision making on part of the operations department as a result of a change in plant conditions from those during the validation period.

V. Management Meetings

X1 Exit Meeting Summary

On March 19, 1999, the Chief Examiner discussed the observations from the exams with Salem's operations and training management representatives via telephone. The Chief Examiner discussed generic candidate performance and comments on the written exam and the operating test. The Chief Examiner also expressed appreciation for the cooperation and assistance that was provided during both the preparation and exam week by the licensee's examination team.

Since there were no observed discrepancies between the simulator and the plant, none were discussed at the exit meeting or in this report.

Attachments:

1. NRC Resolution of Facility Comments
2. Facility Comments on the Written Exam
3. Salem RO Written Exam w/Answer Key
4. Salem SRO Written Exam w/Answer Key

PARTIAL LIST OF PERSONS CONTACTED

<u>SALEM</u>

G. Blinde, Nuclear Training Supervisor - License Training Salem
D. Jackson, Salem and Hope Creek Training Manager
J. Konovalchick, Operations Superintent-Training
J. Lloyd, Senior Training Instructor

<u>NRC</u>

P. Bissett, Senior Operations Engineer, Chief Examiner
D. Silk, Senior Operations Engineer/Examiner
T. Fish, Operations Engineer/Examiner

Attachment 1

NRC Resolution of Facility Comments

Question No. 1 RO

Facility Comment: The original intent of the question was to elicit that there are times when the RO is authorized to take MANUAL rod control and make adjustments. However, those selecting a) did so because b) does not indicate that an abnormal or emergency condition exists. Under normal plant conditions, the CRS would be consulted before taking the rod selector switch out of AUTO (SH.OP-DD.ZZ-0004, 4.1.1.D). Those selecting b) answered it according to their responsibility under abnormal conditions (SH.OP-DD.ZZ-0004, 4.1.3B and 5.8.2).

Facility Recommendation: Accept either a) or b) as correct answers.

NRC Resolution: Agree with the facility's comment. Answers a) or b) will be accepted as being correct.

Question No. 60 RO/55 SRO

Facility Comment: Per answer d), WG41 is designed to limit flow to 32 scfm at the 100% setting. However, the procedure step reads "slowly set WG41≤ 100% position which corresponds to a maximum release rate of 32 scfm." The symbol ≤ makes it seem that WG41 must be adjusted to a specific position in order to achieve the desired flowrate. This makes answer c) also correct.

Facility Recommendation: Accept either c) or d) as correct answers.

NRC Resolution: Agree with the facility's comment. Answers c) or d) will be accepted as being correct.

Question No. 63 RO

Facility Comment: Answer b) is correct as described in the Explanation of Answer. In d), the term "just" was intended to incorrectly locate the SW Accumulator piping tie-in on the CFCU outlet and "flow" was intended to imply the purpose of the accumulator was to maintain SW flow for containment cooling purposes. However, "just" is non-specific and therefore could be interpreted as anywhere upstream of SW223 and "flow" is required to maintain the CFCU full; the water-hammer prevention design purpose of the SW Accumulators.

Facility Recommendation: Accept either b) or d) as correct answers.

NRC Resolution: Agree with the facility's comment. Answers b) or d) will be accepted as being correct.

NRC Resolution of Facility Comments

Question No. 66 RO/59 SRO

Facility Comment: Answer key was incorrect. Should have said b) instead of a).

Facility Recommendation: Change answer key to b) from a) to reflect the correct answer.

NRC Resolution: Agree with facility comment and recommendation. Answer key to be revised to reflect the correct answer as being b) in accordance with applicable facility references.

Question No. 68 RO

Facility Comment: This question was developed as a replacement question during the NRC review week. Conditions were intended to indicate a reduced gas volume and therefore lesser volume injected. However, accumulator pressure is specified at a higher value than the technical specification (TS) value. There is no technical analysis available for an accumulator discharge with a higher than TS water volume and pressure.

Facility Recommendation: Accept either a) or b) as correct answers.

NRC Resolution: Disagree with facility recommendation. Question will be deleted. Impossible for both answers to be correct (one being more, the other being less); there can only be one correct answer. Since the facility did not provide any technical data to substantiate which answer is correct, the only alternative is to delete this question.

Question No. 93 RO/89 SRO

Facility Comment: Per the abnormal procedure, a) is correct. Candidates selecting d) recalled the LOPA-2 steps and training materials for restoration flow. In that case, thermal barrier cooling is restored first, then seal flow. Given the information in choice d), one could assume there had been no seal injection or thermal barrier cooling. Candidates making that assumption would be thinking about the best means of restoring seal flow.

Facility Recommendation: Accept either a) or d) as correct answers.

NRC Resolution: Agree with the facility's comment. Answers a) or d) will be accepted as being correct.

Attachment 2

Facility Comments on the Written Examination

PSEG

Public Service Electric and Gas Company 244 Chestnut Street Salem, N.J. 08079 Phone 609/935-8560

Nuclear Training Center

NTD-99-3007

March 11, 1999

Paul Bissett
Chief Examiner
Division of Reactor Safety
US Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA. 19406-1415

Dear Mr. Bissett:

SALEM RO/SRO WRITTEN EXAMINATION COMMENTS

Attached please find our post-examination analysis and comments package. Per our procedure, any question with less than a 60% correct response rate is reviewed and evaluated. Out of that group of questions, we have identified six for which we are requesting a change. The written examination was reviewed in detail with the candidates on March 8, 1999. There is one minor difference between this submittal and the package provided to you on March 5, 1999, the last day of the examination. The last item on page 1, Exam Item Review Form, in the Review Conclusion column, has been corrected to E (incorrect answer in exam key) rather than F (more than one correct answer). Associated reference materials are attached to each question in support of our request for your further review. Those questions are:

- RO#1 - two correct answers
- RO#60/SRO#55 - two correct answers
- RO#63 - two correct answers
- RO#66/SRO#59 - KEY change
- RO#68 - two correct answers
- RO#93/SRO#89 - two correct answers

Excerpts Only

If you have any questions, comments, or require additional information, please contact Jim Lloyd, Senior Instructor at 609-339-3839, Glen Blinde, Nuclear Training Supervisor at 609-339-3954 or Donald Jackson, Operations Training Manager at 609-339-3746.

Sincerely,

Jerome F. McMahon

Jerome F. McMahon
Director – Quality Assurance/
Nuclear Training/Emergency
Preparedness

/jkl
Enclosure

C (without enclosure)
G. Blinde (120)
D. Jackson (120)
B. Thomas (N21)
NBS RM (N64)

4.0 BACKGROUND

4.1 Reactivity Management

4.1.1 General

A. Reactivity Management is the conservative operating philosophy in which reactor safety and core integrity take precedence over power production and all other associated activities. Positive control over core reactivity must be maintained by the operator at all times. The underlying principle of Reactivity Management is to maintain the reactor in the desired condition by properly anticipating, controlling, and responding to the plant's changing parameters.

B. The ultimate authority and responsibility for core reactivity manipulations resides with the Operations Department. A licensed operator shall be present at the controls at all times IAW 10CFR50.54 (K).

C. All on-shift Licensed Operators are responsible for shutting down, scramming, or tripping the reactor when they determine that the safety of the reactor is in jeopardy or when operating parameters exceed any of the reactor protection setpoints and automatic action has not occurred.

D. All reactivity manipulations must be performed with the knowledge and consent of the CRS so that appropriate SRO oversight is maintained. The purpose of the oversight is to ensure that actions are taken to maximize the operator's control and understanding of the evolution and to minimize the possibility or mitigate the consequences of unexpected reactivity events These actions could include any or all of the following:

- All manipulations must be performed in a deliberate, carefully controlled manner while constantly monitoring nuclear instrumentation and redundant indications of reactor power levels and neutron flux.
- Emphasizing the importance of questioning any evolution that potentially affects reactivity control systems or components.
- Emphasizing the importance of clear responsibilities regarding system or component controls and manipulations.
- Ensuring appropriate personnel are stationed at positions to monitor and to respond to any unexpected reactivity changes.
- Stressing conservative decision making processes.

(Continued on Next Page)

4.1.1 (Continued)

E. Some examples of system manipulations that would require oversight would be the following:

- securing steam loads to limit cooldown rate during low decay heat conditions;
- changes in feedwater system configurations;
- changes in feedwater heater line up;
- cycling any valves that affect steam load;
- reactor recirculation system operations;
- control rod movements;
- boration/dilution operations.

F. Control room activities, such as shift turnover or surveillance testing that could interfere with startup, shutdown, or power changing evolutions, should be avoided or deferred to a later time whenever possible.

G. Operation of reactivity controls in the control room shall be performed by the RO or by another on-shift licensed operator with the consent of the CRS.

H. Personnel in accelerated requalification, in restoration of an inactive but current license to active status in accordance with (10CFR55.53), or in licensed operator training may be allowed to operate reactivity controls, when authorized by the CRS, with the consent of the RO and under the direction and in the presence of an operator possessing an active license.

I. Operation of mechanisms and apparatuses other than Reactivity Controls, which may affect the reactivity or power level of the reactor, shall only be accomplished with the knowledge and consent of the RO and with the authorization of the CRS (During Normal Operations).

J. Licensed operator trainees shall be under the direct supervision of a licensed operator whenever the trainee is manipulating plant components, controls and during the performance of operator rounds and surveillances.

K. During the movement of fuel into, out of, or within the reactor vessel, a licensed Refueling Senior Reactor Operator shall be present and directing the activity.

(Continued on Next Page)

4.1.1 (Continued)

L. Peer Checking shall be performed for any of the following reactivity manipulations under normal plant conditions:

- Turbine Load Adjustments,
- Control Rod Manipulations,
- RCS Boration/Dilution Operations,
- Recirculation Flow Adjustments.

M. During Abnormal or Emergency conditions, Peer Checking shall be used to the greatest extent possible.

N. The STA shall conduct a reactivity discussion at each shift brief. This discussion should address the following plant conditions and parameters, as a minimum:

- When the unit is at power - current boron concentration, Axial Flux Difference, Power Defect, Percent Rod Line, Thermal Limit Margins, and equilibrium or changing Xenon.

- When the unit is shutdown - Shutdown Margin and ORAM status.

4.1.2 Reactor Startup Considerations

A. Maintain strict compliance with all reactivity manipulation procedures. The Plant Manager, Operations Manager, or Assistant Operations Manager shall be present observing reactor startups.

B. A dedicated SRO shall be stationed when performing a reactor startup when directed by the Operations Manager. The dedicated SRO's main responsibility is to ensure that core reactivity is being controlled in a conservative manner.

C. The OS and CRS shall conduct a pre-startup brief using NAP-84 and this standard.

D. Before conducting a reactor startup, ROs shall review the precautions and limitations for reactivity management contained in NAP-5 and this standard.

E. The Reactor Operator conducting the startup shall:

- Have no other responsibilities during the startup.

- Notify the CRS before performing reactivity manipulations.

F. Use multiple methods (such as an ICRR plot and 5-7 doublings of source range counts) for determining criticality.

(Continued on Next Page)

4.1.2 (Continued)

G. Reactor Engineering personnel will supplement Operations IAW NAP-5 to determine Estimated Critical Position, approaches to criticality or reactor physics testing, but a licensed Reactor Operator or Senior Reactor Operator shall be present, controlling reactivity and manipulating the controls. The CRS will be present, observing activities. for all reactor startups.

4.1.3 Normal Power Changes

A. The CRS shall be informed before any non-emergency reactivity manipulations. These include any dilution/boration, rod movement, turbine load changes, or recirculation flow changes. For any of these changes, include the magnitude and direction of the change and the expected responses. If the CRS is not available in the control room area, then the OS shall be informed. For load changes in excess of 5%, a plan for how the load change will be conducted with respect to reactivity should be agreed upon by the CRS and the RO. After the first 5% load change, only periodic updates of plant and reactivity status are necessary.

B. Conservative reactivity manipulations required in response to equipment malfunctions may be performed before notifying the CRS. The CRS shall be informed as soon as possible.

C. Control rods should normally be operated in automatic during steady state power operations.

D. The STA should normally confirm boration and dilution calculations; however, the CRS or PO can confirm reactivity calculations in lieu of the STA.

4.1.4 Transient Conditions

A. The ROs, CRS, and the STA shall frequently communicate plant status to ensure secondary plant responses which may affect reactivity are identified and evaluated.

B. Examples include changes in turbine load, extraction steam isolations, feedwater heater operation, and feedwater flow changes.

C. During transients independent methods of determining core power shall be utilized and correlated to validate indication accuracy.

D. The RO shall closely monitor reactor power using all indications following any secondary transient.

E. True core power may differ from NI indication whenever RCS temperature is outside the programmed band. Prompt reduction in turbine load may be required to ensure reactor power thermal limits are not exceeded.

(Continued on Next Page)

4.1.4 (Continued)

F. Automatic rod control is the preferred method for controlling RCS temperature during transients because it requires less operator oversight. Rod movement should be compared to reactor power, turbine load, and RCS temperature throughout the transient.

G. The STA shall monitor reactivity manipulations during the transient to ensure all methods for monitoring reactor power are being used.

H. Following the transient, reactivity status is to be evaluated and recovery actions discussed.

4.1.5 Reactor Shutdown Considerations

A. The following guidance is to be used when faced with a Shutdown required by Technical Specifications. If there is a high degree of assuredness that the equipment will be returned to service, the shutdown can be delayed, as determined by plant management. If there is a high degree of assuredness that the equipment will not be returned to service within the LCO time limit, initiate the shutdown as soon as practicable. If 3.0.3 is the entry LCO, a unit shutdown shall be commenced within 1 hour.

B. Reactor shutdowns with low decay heat levels present a unique challenge to reactivity control. The operator responsible for control rod insertion must closely monitor nuclear instrumentation. When reactor power has been reduced to below the POAH, the cool-down rate must also be closely monitored to prevent excessive positive reactivity additions.

C. The time required to conduct a reactor shutdown should be minimized. Unnecessary delays due to testing or other evolutions should be avoided whenever possible. In order to minimize these delays, Operations and Reactor Engineering personnel will conduct a review of the shutdown sequence and ensure that all planned testing and evolutions that are planned will not increase the time that the plant is near the POAH.

5.8.1 (Continued)

C. To ensure the appropriate focus on critical plant parameters, the following guidelines should apply:

- RO should monitor critical plant parameters (reactor power, reactor water level, reactor pressure, and turbine load) every five minutes.
- RO should perform a complete board walk down every two hours.
- The RO is expected to know the status of ALL control board, alarm and equipment conditions.
- The CRS is expected to be aware of plant status and should perform review of critical parameters at least once per hour in stable conditions and more often if plant conditions are changing.
- The OS is expected to be aware of plant status and review critical plant parameters at least twice per shift during stable plant conditions and more often if conditions are changing.
- The OS and CRS reviews of plant parameters may include control board walkdowns, computer display reviews, or a review of operating logs.
- The STA is expected to be aware of plant status and to review key parameters at least once every 3 hours if the plant is stable and more often if conditions are changing. The STA performs the engineering and safety overview and should remain available to deal with emergent items.

5.8.2 Load Changes

A. The OS/CRS should approve and direct load changes. However, the RO has the authority to reduce load without approval, if necessary, to respond to a plant or electrical system grid emergency.

B. All control room operators should take appropriate conservative action, when confronted with an abnormal situation, including reactor scram, load reduction, etc.

Question Topic:	Design of WG41

Which one of the following correctly completes the description of the condition that ensures release limits are NOT exceeded when discharging the contents of a WGDT?

The Radioactive Gaseous Waste Release Valve (WG41)...

a. will close when pressure exceeds 2.9 psig upstream of WG41.

b. will close when pressure exceeds 5.3 psig downstream of WG41.

c. must be throttled by the operator to limit the discharge flowrate to 32 scfm during the release.

d. is designed to limit the discharge flowrate to 32 scfm when the valve is full open.

Ans:	d	Exam Level:	B	Cognitive Level:	Memory	

Explanation of Answer	the valve stroke is adjusted to limit the flowrate at 100% open, NOT throttled. There are no AUTO actions as a result of high pressure associated with WG41. 2.9 psig is an interlock preventing WG41 from opening. 5.3 psig is the constant pressure maintained upstream of WG41.

RO#60 – 4 selected c.
SRO#55 – 3 selected c., 1 a., 1 b.

RECOMMENDATION:

- **Accept c. or d. as correct-documentation attached. Per d., WG41 is designed to limit flow to 32 scfm at the 100% setting (Lesson Plan 300-000.00S-WASGAS, pg. 25). However, the procedure step (S2.OP-SO.WG-0008, pg. 8/26) reads "slowly set WG41 to ≤100% position which corresponds to a maximum release rate of 32 scfm". The symbol ≤ makes it seem that WG41 must be adjusted to a specific position in order to achieve the desired flowrate. The four RO's who missed this question have actually performed waste gas releases.**

- **Revise distracter c. prior to next use of this question.**

INSTRUCTOR REFERENCES

a. Regulates the release rate of waste gases to the Plant Vent

   1) Valve stroke is adjusted to limit gaseous release flowrate to 32 scfm at the valve's 100% open position

b. Located in the Auxiliary Building, elevation 64' inside the door of the Gas Decay Tank Valve Room on the right, 8' up

c. Air operated; fails closed upon loss of air or upon the loss of control voltage (125 VDC or 28 VDC)

d. Controlled from the Control Room and from a hand controller on Panel 104

   1) The hand controller must be set to <u>less than</u> 0% or 2WG41 will not latch

   2) 2WG41 begins to open when the indicator is ≅ 20%

ELO 6.d

e. An interlock will not allow 2WG41 to be opened unless Control Air pressure to the valve is ≥ 2.9 psig

ELOs 3.a.xii, 4.l

f. Pressure regulating valve 2WG38 is set to maintain a constant pressure of 5.3 psig upstream of 2WG41 so that a constant flow is maintained while discharging to the Plant Vent

   1) With the upstream pressure fixed, 2WG41 is throttled to the desired release flowrate

g. 2WG41 trips closed if high activity is sensed in the Plant Vent during a release by noble gas monitor R41D

RO#60
RO#55

___ 5.2.14 **COMMENCE** 21 GDT release as follows:

___ A. **POSITION** 2WG41 Selector Switch to OPEN AND **RELEASE** to AUTO position. (Spring return to AUTO).

___ B. SLOWLY **SET** 2WG41 controller to ≤100% position which corresponds to a maximum release rate of 32 SCFM.

___ C. **PERFORM** an Independent Verification of the positioning of 2WG41 on Attachment 1, Section 4.0.

___ D. **RECORD** In Progress Release Data on Attachment 2, Section 5.1.

___ 5.2.15 **PERFORM** the following during 21 GDT release:

NOTE

An operator should be stationed at Panel 104-2 to immediately close 21WG34 upon receipt of a High Radiation Alarm or indication of 2WG41 closure.

___ A. **CALCULATE** 21 GDT Average Release Rate every 10 minutes on Attachment 3,
AND **ADJUST** 2WG41 controller position as required based on results.

___ B. IF Plant Vent Flow Rate Monitor is inoperable,
THEN **RECORD** Plant Vent Flow Rate Discharge Estimation on Attachment 4 at least once every four hours during GDT release.

___ C. **RECORD** Meteorological Data in Attachment 2, Section 5.2.

___ ♦ IF Meteorological Monitor is NOT OPERABLE,
THEN **NOTIFY** the OS/CRS (UFSAR 7.7.2.12).

___ D. IF at any time during the release pressure downstream of 2WG38 is >8.0 psig (2PL8678),
OR 2WG41 CLOSES,
THEN **TERMINATE** the GDT release as follows:

___ 1. **TURN** 2WG41 controller fully counter-clockwise until indicator is <0%.

___ 2. **PLACE** 2WG41-SWT in CLOSE position,
AND **ENSURE** 1WG41 is CLOSED.

(step continued on next page)

Question Topic:	CFCU SW design

Which one of the following correctly describes the protective feature for the CFCUs Service Water System on Unit 1 for a loss of off-site power?

a. A travel stop on closing for SW-223, Outlet flow control valve, protects the piping from overpressure.

b. A bypass line with orifices installed around SW-223, Outlet flow control valve, protects the piping from overpressure.

c. A relief valve installed around SW-223, Outlet flow control valve, mitigates waterhammer when SW flow is re-initiated.

d. A SW accumulator installed just upstream of SW-223, Outlet flow control valve, maintains CFCU Flow until Service Water Pumps are started by the Blackout sequencer.

Ans:	b	Exam Level:	R	Cognitive Level:	Memory	

Explanation of Answer	On Unit 1 (and to be installed on Unit 2 - but currently provided only with relief valve) the orifices provide a path for overpressure protection around the 1SW223 valves. This is for the case of a LOOP where coastdown of the CFCU fans continue to add heat to water in CFCU with discharge valve closed (and inlet check valves closed) causing pressure to rise. As stated the relief valves provide same function on Unit 2. The accumulators are provided to maintain the CFCU piping full to prevent waterhammer when the SW pumps are re-started on the SEC. Only the SW57s Inlet Pressure Control have incorporated the travel stop. The travel stops are set at 100 gpm minimum flow position. This is in excess of the 67 gpm design flow through its respective relief valve SW-531 (Unit 2 only), so a stuck open relief valve will not drain the CFCU.

RO#63 – 3 selected d., 1 a.

RECOMMENDATION:

- **Accept b. or d. as correct. Answer b. is correct as described in the Explanation of Answer. In d., the term "just" was intended to incorrectly locate the SW Accumulator piping tie-in on the CFCU outlet and "flow" was intended to imply the purpose of the accumulator was to maintain SW flow for containment cooling purposes. However, "just" is non-specific and therefore could be interpreted as anywhere upstream of SW223 and "flow" is required to maintain the CFCU full; the water-hammer prevention design purpose of the SW Accumulators (Lesson Plan 300-000.00S-SW0NUC, pgs.18, 19, and simplified drawing).**

- **Revise d. prior to next use of this question.**

INSTRUCTIONAL CONTENT

2) Valves operated from CR Console CC1

a) 21SW-23

(1) Power Supply - 2B 460/230 VAC Vital Bus

(2) Location - Auxiliary Building 78' Elevation, SW Valve Room Penetration

b) 22SW-23

(1) Power Supply - 2B 460/230 VAC Vital Bus

(2) Location - Auxiliary Building 78' Elevation, SW Valve Room Penetration

3) Fail - As-Is

TP-1, 3, *OBJ 3, 4,*

d. Bypass System

Note: These valves can only be use in Mode 5, Mode 6, and Defueled since the system would Not be Operable in accordance with Technical Specifications with either SW-50 OPEN

1) Manual Butterfly Bypass Valves 21(22)SW-50

a) Location – Auxiliary Building 78' Elevation, SW Valve Room

2) Each bypass line has three orifices in series. This function is used to raise flow and lower system header pressure. However the maximum pump discharge pressure is less than the system design pressure, so the bypass system is not needed but provides for system flexibility.

TP-1, 4	***Reference NRC Generic Letter 96-06 and DCP 2EC-3590***

2. Containment Fan Coil Units (CFCU), CFCU Motor Coolers, and SW Accumulator Vessel

Background.

The purpose of the CFCUs are to operate as require during normal, shutdown, emergency, and "blackout" modes to recirculate, filter, and remove heat from the Containment Building atmosphere. They also limit the average containment temperature during normal operation to within design limits.

NRC Generic letter 96-06 identified a concern with CFCUs

INSTRUCTIONAL CONTENT

- Water hammer
- 2 phase flow and
- Over pressurization of Service Water (SW) piping due to thermal expansion.

These conditions are relative to maintaining the existing design bases of the facility by ensuring that the structural integrity of the SW is maintained during a Loss of off-site power (LOOP) coincident with a LOCA, or MSLB

These conditions could cause containment temperature to rise rapidly, while SW flow is lost to CFCUs due to SW pumps waiting to be restarted by SEC after EDG loads. Salem has addressed the concerns expressed in this letter by instituting design changes that mitigate these concerns.

During a Mode I Accident, the CFCUs will be loaded onto their respective vital busses at 20 seconds following the SI signal.

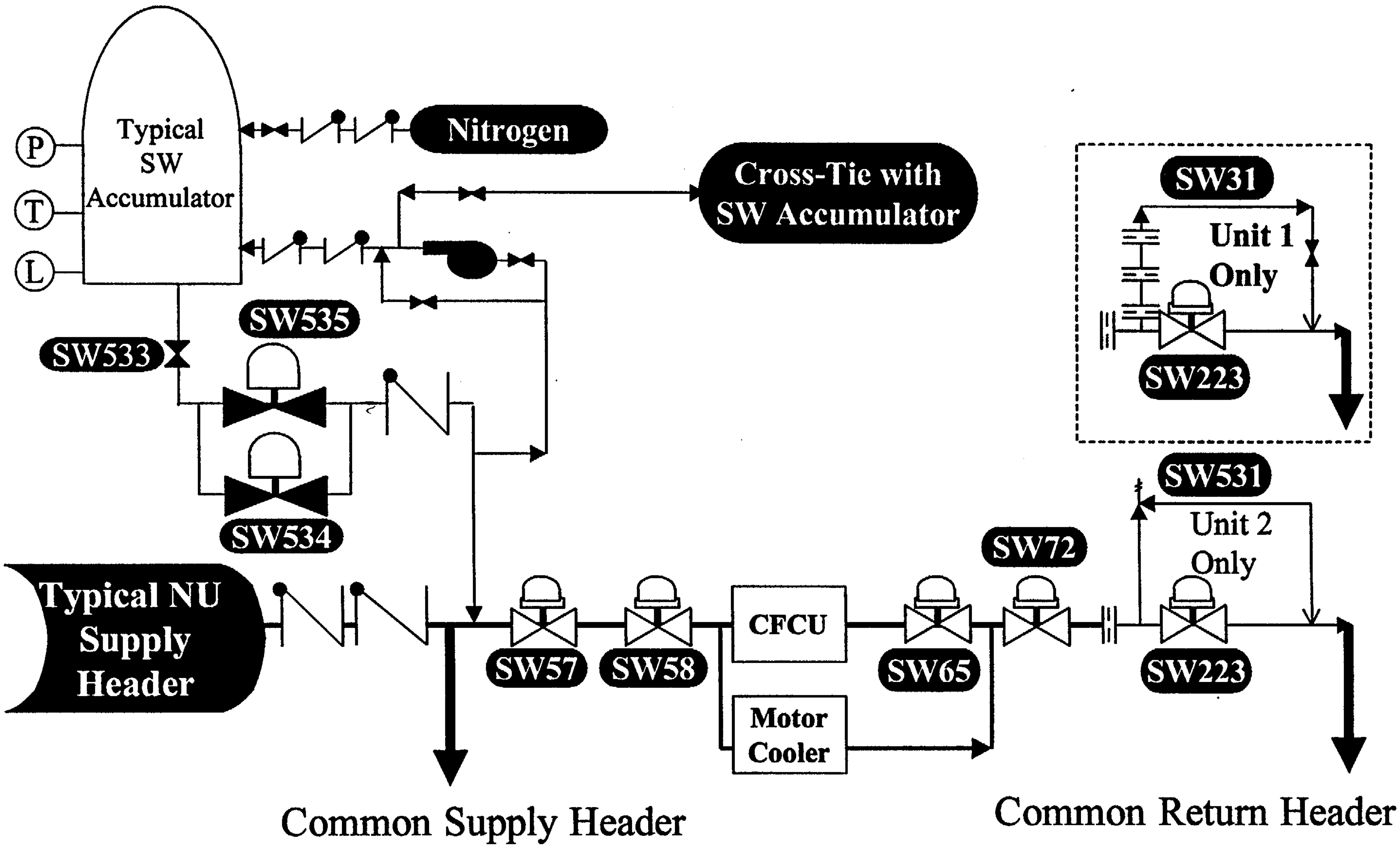
During a Mode III Accident, the loading will occur 33-37 seconds following initiation of SI. On the outlet of the CFCUs, SW-223 valves (one for each CFCU) are also closed until the respective CFCU is restarted. Each Nuclear Header supply to the CFCUs has two check valves in series. These check valves prevent draining of CFCUs. During the accident the CFCU fans would be coasting down drawing heated Containment air across the CFCU coils. This would heat the stagnant water in the coils, causing:

- Expansion of the water creating an overpressure condition in the CFCU coils, and
- 2 phase mixture of water in coils, causing water hammer when SW pumps restart. This water hammer would be exacerbated by the partial draining of the SW as the SW-223 is going closed.

Note: Relief valves SW-531 (one for each CFCU, Unit 2 only) will be replaced with the same design as Unit 1, restricting orifices that will allow a flow of 30 gpm at 150 psig inlet pressure. The design change will be in accordance with 2EC-3590, package 19. The piping will also contain a locked open isolation valve.

Relief valve SW-531 (one for each CFCU) precludes the above overpressure / water hammer conditions. This event would also be mitigated by the injection of water from the SW Accumulator Vessels (upon loss of all three 4KV Vital Buses on under voltage). The water injection would ensure the CFCU piping remains filled.

TP-1, 4
OBJ 3, 4, 6



SW ACCUMULATOR VESSEL AND CFCU (SIMPLIFIED)

1 LEB 7/29/98

Question Topic:	Urgent alarm during dropped rod/recovery

Given the following conditions on Unit 2:

- A reactor startup is in progress
- All Shutdown Bank rods are fully withdrawn
- Control Banks A, B are fully withdrawn
- Control Bank C is being withdrawn at 210 steps
- Control Bank C rod H-14 dropped due to a fuse failure

Which one of the following correctly completes the statement about the status of the ROD BANK URGENT FAIL alarm (OHA E-40)?

The alarm actuates...

a. after the fuse failed and rod motion was commanded.

b. only when the rod is being recovered.

c. only after H-14 clears 20 steps during recovery operations

d. as soon as the rod was misaligned from the bank by at least 12 steps

Ans:	a	Exam Level:	B	Cognitive Level:	Comprehension

Explanation of Answer	The alarm initially actuates due to logic failure. There is a note in the rod recovery procedure indicating that it will alarm on regulation failure when the rod is being recovered. However, for b. the word only makes it incorrect. For c. the 20 steps is associated with the rod bottom bistable and has no impact on the urgent failure alarm. For d. the alarm is not tied to rod position.

RO#66 – 7 selected b.
SRO#59 – 6 selected b.

RECOMMENDATION:

- **Change the KEY to b. as the correct answer-documentation attached. This question was revised numerous times during the examination development process. On the final revision, the explanation, the KEY, and the conditions were not re-evaluated to ensure that all matched. A failed fuse resulting in a single dropped rod in a control bank only causes an URGENT FAILURE alarm when the lift coils for the other group rods are disconnected and the dropped rod is retrieved (per S2.OP-AB.ROD-0002, pg. 5).**
- **Specify the fuse as the stationary gripper coil and make b. the correct answer, prior to next use of the question.**

RO Q# 66
SRO Q# 59

___ 3.32 MONITOR Tavg for necessary adjustments until the rod has been realigned.

___ A. MAINTAIN Tavg within 1.5°F of program by one of the following methods:

___ ♦ Adjusting Turbine load

OR

___ ♦ Adjusting Steam Dumps or Atmospheric Relief Valves (MS10s)

OR

___ ♦ Adjusting Boron concentration

CAUTION

Tavg should be returned to within 1.0°F of program before operating the Rod Bank Selector Switch through the AUTO position or rod motion will occur, and cause Bank Overlap Unit misalignment from actual rod position.

___ 3.33 SELECT the affected bank with the Rod Bank Selector Switch.

NOTE

If the dropped rod is not in Shutdown Bank C or D, a Rod Bank Urgent Failure Alarm (OHA E-40) will activate when the rod is moved due to Lift Coil Disconnect Switches being open.

___ 3.34 WITHDRAW the dropped rod over the duration specified by Reactor Engineering, until the Group Step Counter is returned to the value recorded in Step 3.26.

3.35 Was the dropped rod in Shutdown Bank C or D?

___ NO ___ YES———> GO TO Step 3.41 ______ Time

|
V

2.2 Entry Conditions - Entry into this procedure is required anytime there is indication of one or more rods either partially or fully dropped.

Symptoms of a dropped rod are as follows:

- Deviation between the Individual Rod Position Indication (IRPI) and the bank Group Step Counter (GSC) or other IRPIs in the same bank
- Abnormal variations in axial flux distribution
- Abnormal quadrant power distribution
- Rod bottom light on RP3
- Sudden power level drop
- OHA-E-48, ROD BOTTOM
- P-250 computer position indication
- Rod deviation alarm

All symptoms may not occur depending on core location and whether or not the rod has fully dropped. Other symptoms may occur as a result of the dropped rod such as a Tavg drop or negative rate flux trip but are dependent on power level and core location.

2.3 Immediate Action - Ensures a Reactor trip is initiated if multiple rod drops occur. This action is not required to insure DNBR > 1.3. Current safety analysis shows that DNBR will never fall below this limit for all single and multiple rod drop cases without a reactor trip. The power range negative rate trip is not credited in the accident analysis. Manual reactor trip on confirmation of multiple rod drops is considered good practice since multiple rod drops is an indication of multiple common mode malfunctions.

2.4 Subsequent Actions - Step 3.1 stops or prevents outward rod motion to correct Tavg. Steps 3.2 and 3.3 stabilize plant conditions. If the Reactor were to go subcritical as a result of a single dropped rod, Steps 3.4 through 3.7 provide direction for the Operator to insert all rods and initiate action to determine and correct cause of the dropped rod. This procedure would not be appropriate to recover the dropped rod in this case since its recovery would constitute an approach to criticality. It is appropriate to correct the cause of the dropped rod and then return to critical using the appropriate startup procedure. It is expected that the SNSS/NSS will refer to all Technical Specifications that could apply to this condition. Technical Specification 3.1.3.1.c provides guidance for a misaligned rod. Technical Specification 3.1.3.4 provides guidance if the dropped rod is in a shutdown bank. Technical Specification 3.1.3.5 provides guidance for rod insertion limits.

If a Control Rod is dropped during rod operability testing, it is highly likely that the remainder of the bank will be below the rod insertion limits. If this is the case, Step 3.9 provides guidance for a power reduction to restore rod index limits. Steps 3.10 and 3.11 ensure QPTR and AFD are maintained within Technical Specification limits if power is above 50% RTP where the specifications apply. If a power reduction is necessary to maintain these limits, then the Operator is directed to borate to do so. Further rod motion is avoided until the cause of the rod drop can be determined to avoid the possibility of more dropped rods. Step 3.12 is provided for the case in which the procedure may be entered if an IRPI were to fail low or IRPI indicates a rod drop unsupported by other indications. Normally the Operator should have no doubt that an actual rod drop has occurred. However, in cases such as at very low power level, if the rod does not fully insert, indications such as a rod bottom light and flux variations may not occur. If positive indication of a rod drop does not occur, Steps 3.12 through 3.14 determine if it is only an IRPI problem, and if so, directs the Operator to the appropriate AB. If a rod drop has occurred, the Reactor Engineer (RE) is requested to provide assistance in rod recovery. The RE is expected to provide guidance for rate of recovery based on core location and the amount of time the rod has been dropped and also the power level at which recovery should be attempted. Steps 3.15 through 3.18 are provided for the case in which the RE determines that rod recovery should not occur based on the amount of time the rod has been dropped. Step 3.20 directs the Operator to correct the cause of the dropped rod. It is recognized that this will be an interdepartmental effort, however, the step is directed at the Operator such that rules of usage will require the problem to be corrected prior to proceeding to Step 3.22. Step 3.22 determines if the dropped rod is fully inserted. If it is not, Step 3.23 directs the Operator to the procedure for misaligned rods. The reason for this is that the procedure for rod realignment differs from this procedure to recover a rod, in that the necessary steps for Group Step Counter manipulations for maintaining proper rod group stepping logic is significantly different. Once the RE has determined the necessary requirements to recover the rod and has given his approval, the Operator may proceed. Steps 3.26 through 3.29 reset position indication to zero to match that of actual rod position. The P/A Converter need only be reset if the dropped rod is in Group 1 of a control bank since only this group sends signals to the P/A Converter. This will cause the low and low-low insertion limit alarms to actuate. The bank position is recorded for information only in Step 3.28 and is not used later in the procedure. When the rod is realigned, the P/A Converter reading for the affected bank should have returned to its original counts. Steps 3.29 through 3.34 attempt to recover the rod. The Operator is withdrawing the rod by monitoring the GSC reading. Since this is a demanded indication, these steps are not concerned with actual rod motion. Once the rod is returned to the original GSC position, Steps 3.36 through 3.40 directs any additional actions that must be taken to ensure proper Group 1 - Group 2 step sequencing. Step 3.44 questions whether or not there is positive indication the rod has been recovered. It is possible that a negative rate trip was received on one NIS channel. If so, step 3.45 directs Operator to reset the trip bistable. Note that this step is bypassed if the dropped rod was not recovered. The reason for this is that if another rod were to drop and cause a second NI channel to trip, a Reactor trip would occur.

Step 3.46 has the Operator clear the Rod Bank Urgent Failure alarm that would have come in when the rod was recovered (unless it was a S/D Bank C or D rod). Since to have remained in this procedure, the rod had to have fully dropped (Step 3.22), it should be expected that the rod is not bound and that it should withdraw. However, the possibility exists that it may not. If this is the case, Technical Specification 3.1.3.1.a will apply. This specification will require a shutdown to Hot Standby if the unit is initially in Modes 1 or 2. If it has been determined that the rod did not move during attempts to realign it, then the Operator is directed to place the Unit in Hot Standby to comply with Technical Specification 3.1.3.1. It should be noted that the Unit may already be in Hot Standby, if this is the case, then the intent of this step is already met. If the rod was recovered, then the Operator is directed to perform the surveillance for rod operability.

END OF DOCUMENT

Question Topic:	Accumulator

Given the following conditions:

- 23SJ54, Accumulator Isolation Valve, is closed due to high level in the accumulator caused by leakage past 23SJ55 (check valve)
- 23SJ54 is energized with the VALVE OPERABLE position selected on Panel 2RP4
- 23SJ29, Accumulator Relief Valve, has lifted and reduced nitrogen pressure to 675 psig
- 23 SI Accumulator level is 78%

Which one of the following correctly states the response of the 23 SI Accumulator if a Design Basis LOCA occurs on the 22 Loop Cold Leg, at this time?

a. 23SJ54 automatically opens and 23 SI Accumulator will deliver a greater volume of water than design.

b. 23SJ54 automatically opens and 23 SI Accumulator will deliver a smaller volume of water than design.

c. 23SJ54 must be opened by the Control Room Operators and will deliver a greater volume of water than design.

d. 23SJ54 must be opened by the Control Room Operators and will deliver a smaller volume of water than design.

Ans:	b	Exam Level:	R	Cognitive Level:	Comprehension	

Explanation of Answer	b. Correct. As long as 2SJ54 operator is energized, the valve will open automatically if an SI Signal is received. With the reduced volume of nitrogen available, less volume of water will be delivered to the RCS.

RO#68 – 4 selected a., 1 c.

RECOMMENDATION:

- **Accept a. or b. as correct. This was developed as a replacement question during NRC review week. Conditions were intended to indicate a reduced gas volume and therefore lesser volume injected. However, accumulator pressure is specified at a higher than technical specification (TS) value. There is no technical analysis available for an accumulator discharge with a higher than TS water volume and pressure. With power available and valve operable selected, SJ54 will stroke open on a SI.**

- **Revise the initial conditions prior to next use of this question.**

RO 9 #68

PSE&G CONTROL COPY # 0027

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

ACCUMULATORS

LIMITING CONDITION FOR OPERATION

3.5.1 Each reactor coolant system accumulator shall be OPERABLE with:

a. The isolation valve open,

b. A contained volume of between 6223 and 6500 gallons of borated water,

c. A boron concentration of between 2200 and 2500 ppm, and

d. A nitrogen cover-pressure of between 595.5 and 647.5 psig.

675 is greater than Tech Spec

APPLICABILITY: MODES 1, 2 and 3*.

ACTION:

a. With one accumulator inoperable, except as a result of a closed isolation valve or boron concentration outside the required limits, restore the inoperable accumulator to OPERABLE status within one hour or be in HOT SHUTDOWN within the next 12 hours.

b. With one accumulator inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in HOT STANDBY within one hour and be in HOT SHUTDOWN within the next 12 hours.

c. With the boron concentration of one accumulator outside the required limits, restore the boron concentration to within the required limits within 72 hours or be in at least HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than or equal to 1000 psig within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each accumulator shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1. Verifying the water level and nitrogen cover-pressure in the tanks, and

2. Verifying that each accumulator isolation valve is open.

* Pressurizer Pressure above 1000 psig.

3/4.5.1 ACCUMULATORS

The OPERABILITY of each RCS accumulator ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure falls below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on accumulator volume, boron concentration and pressure ensure that the assumptions used for accumulator injection in the safety analysis are met.

The accumulator power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these accumulator isolation valves fail to meet single failure criteria, removal of power to the valves is required.

The limits for operation with an accumulator inoperable for any reason except an isolation valve closed minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional accumulator which may result in unacceptable peak cladding temperatures. If a closed isolation valve cannot be immediately opened, the full capability of one accumulator is not available and prompt action is required to place the reactor in a mode where this capability is not required.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the accumulators is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long term core cooling capability in the recirculation mode during the accident recovery period.

Question Topic:	Required operations during CR Evacuation

The operators are initiating seal injection to the RCPs in accordance with S2.OP-AB.CR-0002 "CONTROL ROOM EVACUATION DUE TO FIRE IN CONTROL ROOM, RELAY ROOM, OR CEILING OF THE 460/230V SWITCHGEAR ROOM".

Which one of the following correctly describes a requirement for establishing seal injection?

a. Control Air is in service for control of 2CV55.

b. 125 VDC is in service for breaker control on 21 or 22 Charging Pump.

c. 230 VAC power is available for operation of 2CV68 or 2CV69, Charging Header Isolation Valves.

d. CCW is available for the thermal barrier heat exchangers.

Ans:	a	Exam Level:	B	Cognitive Level:	Comprehension	

Explanation of Answer	To establish seal injection flow, a Charging pump must be started and requires support from AC Power, SW and CCW. Control Air is necessary to operate CV55. Charging Pump breakers can be closed without 125 VDC power available. 2CV71 is isolated in the procedure, 2CV68 and 2CV69 do not need to be closed and could be manually operated, if necessary. CCW is not required to the Thermal Barrier HX's in order to establish seal flow.

RO#93 – 4 selected d., 1 b.
SRO#89 – 1 selected d., 1 b.

RECOMMENDATION:

- **Accept a. or d. as correct-documentation attached. Per the abnormal procedure, a. is correct. Candidates selecting d. recalled the LOPA-2 steps and training materials (Lesson Plan 300-000.00S-LOPA00, pg. 16 and 17, and ERG Document ECA-0.0, pg. 8) for restoration of seal flow. In that case thermal barrier cooling is restored first, then seal flow. Given the information in choice d., one could assume there had been no seal injection or thermal barrier cooling. Candidates making that assumption would be thinking about the best means of restoring seal flow.**

- **Revise the question and/or change distracter d. prior to the next use of this question.**

PROCEDURE PHILOSOPHY

The procedure was developed by a three-fold method. First trip Rx and assemble at the area immediately outside the double entrance doors to the Control Area Corridor (this is the quickest access point within the immediate vicinity of the CR and outside the CR fire zone), secondly to go to Hot Standby and finally to go to Cold Shutdown. Generic Letter 86-10 provides a Reactor Trip from the Control Room, but no other actions can be relied upon even though every attempt should be made. The philosophy is that every cable, piece of equipment or component that passes through or is in the fire zone is considered lost or unreliable. Unreliable can be exemplified in that a logic circuit could initiate and a spurious operation or hot short could reverse the logic initiation and thus invalidate it. Therefore, even though attempts are made from the Control Room prior to evacuation, all actions must be validated with manual actions to place equipment in a position that cannot be reversed with the exception of the Reactor Trip.

The plan or method of going to Hot Standby is also three-fold. First, Seal Flow must be established to RCPs to eliminate the possibility of a LOCA as a result of a possible loss of Component Cooling and Charging. Secondly, is to isolate the RCS. Thirdly, isolate the Steam Generators and initiate AFW. This method is accomplished through the distribution of Attachments to each Supervisor/Operator and he/she is to proceed and perform these actions. There are stop points in the attachments for coordination purposes.

To accomplish seal flow to the RCPs, there are other necessary prerequisites other than just the starting of a charging pump. Air is necessary for the operation of the CV55 valve, AC power, component cooling and service water are necessary for the charging pump. AC power may be provided by either off-site power being available or emergency diesel generators.

Gaining control of the RCS involves closing PORV Block valves, tripping RCPs for natural circulation, and establish charging and letdown prior to entering cold shutdown.

In order to isolate the Steam Generators, all steam piping must be addressed. Therefore not only are the MSIVs addressed, but also MS10s and MS18s. Even though MS10s will be utilized at a later time frame, the procedure provides directions to obtain initial control and then later utilizes MS10s in a controllable manner. Also part of the Steam Generators control is obviously establishing the AFW System.

The Immediate Actions are self explanatory; trip the reactor, ensure everyone safety and provide notification to field personnel in order for their response.

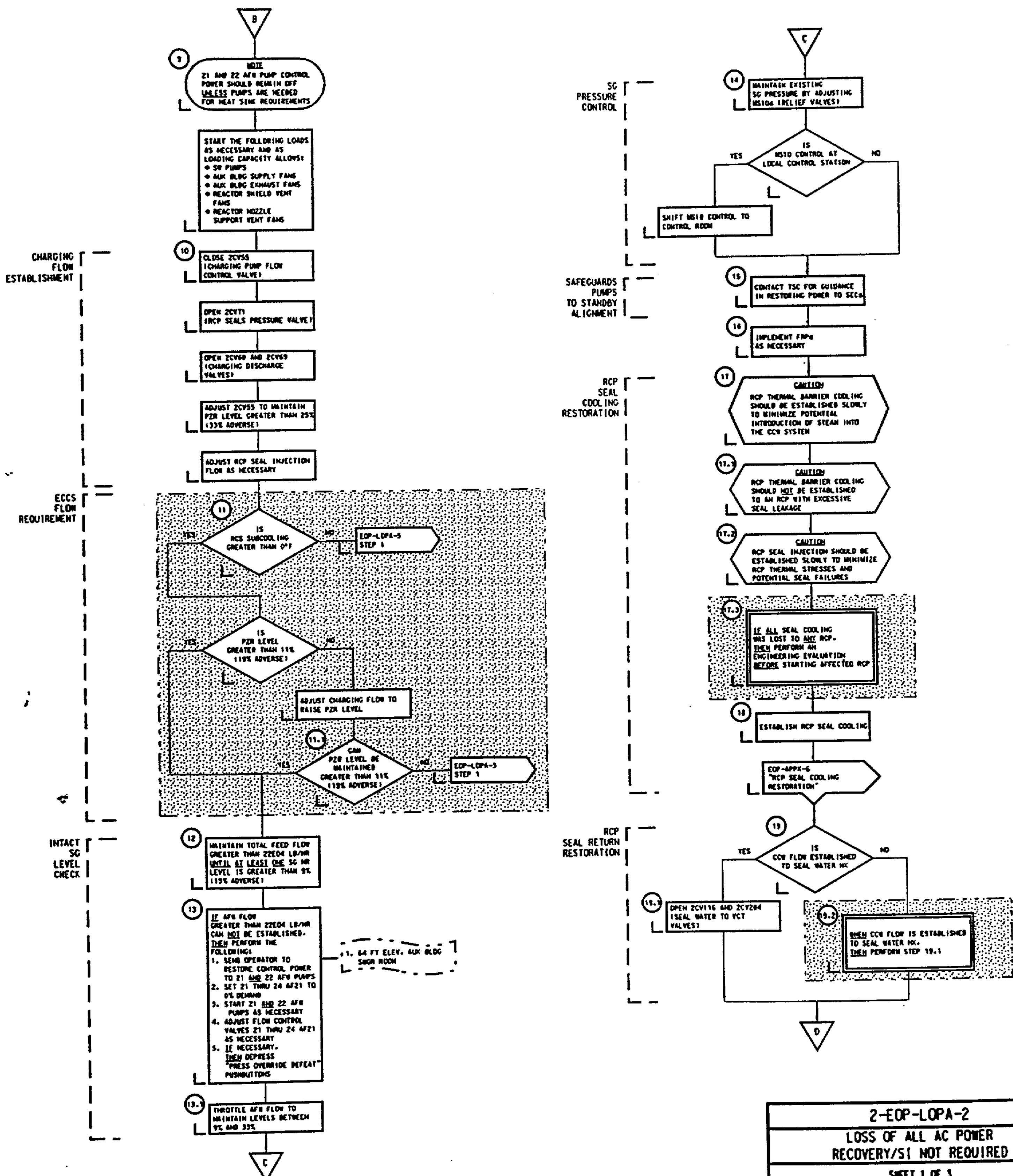
The Subsequent Actions are identified by individual watchstanders. The following provides the reasoning of the action steps in each of the Attachments:

ATTACHMENT 1 (OS)

Step 1 are to assemble and obtain the necessary materials to perform his/her functions.

Step 2 notifies Security of the situation and that security doors will be breached by operations personnel and requests their assistance.

DRAWING NUMBER: 2-EOP-LOPA-2 / SH 1



2-EOP-LOPA-2	
LOSS OF ALL AC POWER RECOVERY/SI NOT REQUIRED	
SHEET 1 OF 3	
REV 21	REV DATE 10 JAN 97
SALEM GENERATING STATION	UNIT 2

Reducing RCS temperature reduces the thermal degradation of materials and thermal expansion effects that tend to degrade the seal system sealing capability and sealing life. Consequently, any actions to reduce RCS pressure and temperature during a loss of all ac power event are consistent with minimizing RCS inventory loss and maximizing time to core uncovery.

Benefits and Consequences of Restoring Seal Cooling

Following the restoration of ac power, the operator will have the capability to restore seal cooling by reestablishing seal injection flow or reestablishing thermal barrier cooling using the component cooling water system. Restoring seal cooling may have several benefits such as reducing seal leakage and preventing further damage to the seal components. However, Westinghouse has not performed an analysis of how the RCP seal package will react as the seals cool, fits contract, the shaft moves, etc., possibly with partially extruded O-rings. There may be a potential to make seal leakage worse by restoring seal cooling, depending on how it is done.

The RCP Vendor Manual identifies limits for reestablishing seal cooling to a hot seal package to prevent further damage due to thermal shock and to prevent warping of the RCP shaft due to uneven cooling. These limits are only intended for a loss of seal cooling of short enough duration that the seal package heatup is limited. Although the limits have been extrapolated for an extended loss of seal cooling event in the past, they have not been validated for such an event that is beyond the design basis of the RCP. Therefore, no specific conclusions may be taken from the RCP vendor manual guidance for reestablishing seal cooling following an extended loss of seal cooling event. The following provides a qualitative assessment that determines the most appropriate method of restoring seal cooling following an extended loss of all ac power event:

To minimize the potential for thermal shock of the seals and shaft warping, component cooling water can be established to the thermal barrier heat exchanger before seal injection is established. Note that since the loss of all ac power event is beyond the design basis of the plant, the performance of the CCW system has never been analyzed under these conditions. Establishing

- A maximum leakage analysis estimates maximum flow to be approximately 300 gpm. This estimate assumes the following:
    - Full DP across the thermal barrier labyrinth seals
    - Seals totally ineffective in limiting leakage.
    - Actions are taken to reduce leakage
        - Reducing pressure reduces seal Delta-P and therefore reduces the leakrate.
        - Reducing temperature reduces the amount of seal degradation and therefore reduces the leakrate.
        - Any actions to reduce RCS temperature and pressure during the event are consistent with reducing inventory loss and maximizing time to core uncovery.
- RCP seal cooling restoration
    - It is desirable to restore seal cooling as soon as practical to reduce seal temperature and potential degradation.
    - Field experience has shown however, that restoration must be done in a controlled manner to avoid thermal shock and related damage.

Obj. 3

- Uncontrolled restoration of seal cooling to a hot RCP and subsequent restart of the RCP can result in:
    - Bent shafts due to abnormal temperature gradients and stresses across the shaft as seal cooling is restored.
    - Bearing and seal damage after pumps are started due to non-uniform sealing surfaces and crud buildup.
- Restoration of seal cooling must be performed in accordance with the RCP instruction and operating manual.

- In general terms, these requirements are to:
  - Lower thermal barrier cooling water (CCW inlet) temperature, if required.
  - Reestablish CCW to the thermal barrier.
  - Reestablish seal injection flow.
- When reestablishing both seal injection and thermal barrier cooling, seal inlet temperature is reduced at less than 1°F/min until temperatures are low enough to permit normal flowrates without shocking RCP components.

Obj. 4

- RCP restart
  - Following restoration of seal cooling, the pump should not be restarted prior RCP status evaluation in order to minimize potential damage.
  - In general, the status evaluation consists of the following 3 elements:
    - The pump shaft is rotated by hand (if conditions permit).
    - The RCP is restarted while monitoring vibration and seal leakage. If they are acceptable, the pumps are used for a forced circulation cooldown of the plant to CSD.
    - If they are not acceptable, the pumps are tripped and natural circulation is used for the cooldown. Upon achieving CSD conditions the pump(s) must be disassembled and visually inspected.

Attachment 3

SALEM RO WRITTEN EXAM W/ANSWER KEY

U.S. Nuclear Regulatory Commission
Site-Specific
Written Examination

Applicant Information	
Name:	Region: I / II / III / IV
Date:	Facility/Unit: Salem
License Level: RO / SRO	Reactor Type: W / CE / BW / GE
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. The passing grade requires a final grade of at least 80.00 percent. Examination papers will be collected ~~four~~ five hours after the examination starts.

Applicant Certification

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

____
Applicant's Signature

Results

Examination Value	99 ~~100~~ Points
Applicant's Score	______ Points
Applicant's Grade	______ Percent

1. Which one of the choices below correctly completes the following statement concerning the Rod Selector switch?

   The Rod Selector Switch should remain in AUTO...

   a. except as directed by the CRS.

   b. but may be placed in MANUAL for Tave adjustments.

   c. unless inserting rods during an ATWS, then MANUAL shall be selected immediately.

   d. but if required to be placed in MANUAL, the CRS must directly observe all rod movement.

2. Given the following conditions:

   - The on-coming Day Shift Reactor Operator (RO) is returning to shift after 4 days vacation
   - Today is February 22, 1999

   Which one of the following correctly identifies the date of the earliest Control Room Narrative Log the RO is required to review prior to participating in the shift turnover today?

   a. February 20, 1999.

   b. February 18, 1999.

   c. February 17, 1999.

   d. February 15, 1999.

3. Given the following conditions:

   - Unit 1 is performing a startup on Day Shift
   - The crew is preparing to synchronize the main generator to the grid
   - The PO reports to the Control Room Supervisor (CRS) that the 0730 Technical Specification log readings are not completed
   - Current time is 1030

   In accordance with SC.OP-AP.ZZ-0110. Use and Development of Operating Logs, which one of the following correctly identifies the required actions?

   The Log readings...

   a. shall be completed and reviewed before 1130.

   b. shall be completed and reviewed before 1330.

   c. have been missed. Make an entry in the narrative log that readings have been missed.

   d. have been missed. Make an entry in the narrative log that readings have been missed and refer to Technical Specifications for any required actions.

4. The Unit 1 on-shift RO has noticed an obviously incorrect value logged on the previous shift's Control Room logs.

   In accordance with SH.OP-DD.ZZ-0004, Operations Standards, which one of the following correctly describes all of the actions you shall take to correct the log reading?

   a. The incorrect value shall be circled in red and the correct value, with an explanation, placed in the comments section.

   b. The incorrect value shall be circled in red and the correct value logged . These changes will be initialed and dated by the original operator when next on shift.

   c. A single line shall be drawn through the incorrect value, the correct value logged and the change dated and initialed. The correct value should then be circled in red with an explanation placed in the comments section.

   d. A single line shall be drawn through the incorrect value, the correct value logged and the change dated and initialed. The log cannot be submitted until the reading is also initialed by the original log taker.

5. Which one of the choices below correctly completes the following statement concerning control of plant power changes?

   For Mode 1 power changes ...

   a. neither the CRS nor OS is required to be notified in advance of a normal dilution for Axial Flux Difference (AFD) control.

   b. the CRS does NOT need to be informed prior to reducing load in response to a Feedwater problem.

   c. the STA must be present at the controls for a power change of greater than 5%.

   d. the STA must verify all boration and dilution calculations prior to the evolution.

6. Excessive stroking of motor operated valves (MOV's) during surveillance testing has been identified as a reason for premature failure of motor actuators.

   Which one of the following correctly identifies the procedural limit for full strokes on a MOV during surveillance testing in accordance with S1.OP-ST.SJ-0003, Inservice Testing Safety Injection Valves Modes 1-6?

   a. 2 per hour

   b. 3 per hour

   c. 4 per hour

   d. 5 per hour

7. Unit 2 has been operating at power for several months. Due to an inadvertent dilution, the following power history occurred:

   0300 - 100%
   0315 - 100.1%
   0320 - 100.3%
   0325 - 100.5%
   0330 - 100.8%
   0335 - 101.2%
   0340 - 101.8%
   0345 - 101.5%
   0350 - 100.9%
   0355 - 100.2%
   0400 - 100%

   Which one of the following correctly completes the statement concerning Reactor Power?

   The Control Room crew shall...

   a. begin a shutdown due to exceeding Rated Thermal Power.

   b. reduce power to obtain a 24 hour average power of no greater than 100%.

   c. maintain power less than or equal to 100%. Since the transient is over no further action is required.

   d. reduce power so the average for the 12 hour shift is no greater than 100% power.

8. SJ1, RWST to Charging Pump Suction valve has been manually operated and positioned fully open.

   Which one of the following correctly describes how the Reactor Operator/Plant Operator know that particular valve has been manually operated?

   a. The OPEN indication will be illuminated and an Info Tag (sticker) will be affixed to the bezel.

   b. The OPEN indication will be illuminated and a White Caution Tag (sticker) will be affixed to the bezel.

   c. The position indication will be extinguished and a Red Blocking Tag (sticker) will be affixed to the bezel.

   d. The position indication will be extinguished and an Info Tag (sticker) will be affixed to the bezel.

9. In 1999, an Equipment Operator received 450 mrem while visiting a foreign nuclear plant as part of a Technical Exchange Program. The Operator's prior exposure at Salem was 175 mrem for the current year.

   If no exposure limit extensions have been authorized, which one of the following correctly lists the MAXIMUM additional non-emergency Total Effective Dose Equivalent (TEDE) that this individual could receive at Salem for the remainder of 1999?

   a. 1375 mrem

   b. 1825 mrem

   c. 3375 mrem

   d. 3825 mrem

10. Given the following conditions:

    - An independent verification is required on two valves in an area with a 75 mr/hour dose rate

    Which of the following correctly identifies the maximum time allowed for the independent verification before the requirement for the "hands-on" verification may be waived?

    a. 5 minutes

    b. 8 minutes

    c. 10 minutes

    d. 12 minutes

11. Unit 2 is operating at 100% power with all systems in automatic. Intermediate Range (IR) Channel N35 failed several days ago and has been properly removed from service.

    Which one of the following correctly identifies an expected crew response if a Reactor Trip were to occur?

    a. The Reactor Trip can be confirmed with one IR Channel.

    b. The Reactor Trip cannot be confirmed with only one IR Channel.

    c. The Reactor Trip can be confirmed after the crew manually energizes the Source Range detectors.

    d. The Reactor Trip cannot be confirmed since Source Range detectors will not energize until jumpers are installed.

12. While Unit 2 was operating at 100% power, a LOCA occurred. The crew has just transitioned from EOP-TRIP-1 to EOP-LOCA-1. The following conditions exist:

- All rods are fully inserted
- No RCPs are operating
- Nine (9) CETs are >700 degrees, no CETs are >1200 degrees
- Pressurizer level is 96%
- Containment pressure is 28 psig
- Containment Sump level is 52%
- RWST level is 17 ft.
- All loop Tc's are 300 degrees
- RVLIS indicates 43%
- RCS pressure is 265 psig

Which one of the following statements correctly identifies the next procedure to be implemented?

a. EOP-LOCA-5, Loss of Emergency Recirc.

b. EOP-FRCC-2, Response to Degraded Core Cooling.

c. EOP-FRCI-1, Response to High Pressurizer Level.

d. EOP-FRCE-1, Response to Excessive Containment Pressure.

13. Which one of the following correctly completes the statement of requirements for making notifications to the State and Local Agencies?

The Primary Communicator shall complete the notifications within 15 minutes after...

a. the NRC Emergency Operations Center is notified.

b. the Emergency Action Level condition is met.

c. the Emergency Coordinator makes the event classification.

d. receiving the Initial Contact Message Form from the Emergency Coordinator.

14. During normal power increases, as turbine load is increased, which one of the following parameters is utilized to determine the output value of the Variable Gain Unit of the Rod Control Reactor Control Unit ?

    a. Total Steam Flow

    b. Auctioneered Hi Tavg

    c. Turbine impulse pressure

    d. Auctioneered Hi Nuclear Power

15. Given the following:

    - Reactor Power is 75%
    - A failure of control rods to move in AUTO or MANUAL has occurred

    Which one of the following correctly lists the function that is impaired if control bank D rods are moved using the CBD position of the Rod Selector Switch?

    a. The Pulse-To-Analog display for Control Bank D.

    b. Bank overlap function when rods are inserted.

    c. Rod Insertion Limit alarms when inserting control rods.

    d. Control Rod Stop alarm actuation when C-11 is reached.

16. An Estimated Critical Position (ECP) calculation was performed and boron concentration was adjusted for a critical rod height of Control Bank D at 58 steps. However, personnel performing the ECP incorrectly used the BOL HFP Curves instead of the BOL HZP curves when determining control bank rod worth.

    Which one of the following correctly describes the effect this error would have on critical rod height?

    a. Rod position at criticality would be lower than the ± 300 pcm administrative limit.

    b. Rod position at criticality would be lower than calculated but above the ± 300 pcm administrative limit.

    c. Rod position at criticality would be higher than calculated but less than the ± 300 pcm administrative limit.

    d. Rod positioin at criticality would be higher than the ± 300 pcm administrative limit.

17. A loss of coolant accident has occurred. The RVLIS Summary Display Page is displaying dynamic range. During a cooldown and depressurization, void content indication remains constant at 80%.

    Which one of the following correctly describes actual void content response during this cooldown and depressurization?

    Actual void content:

    a. increased due to change in density as pressure and temperature decreased.

    b. decreased due to change in density as pressure and temperature decreased.

    c. remained constant; differential pressure alone is an accurate indication of void content.

    d. remained constant; indicated void content is compensated using pressure and temperature signals.

18. The following conditions exist:

    - Unit 1 is in Mode 4
    - RCS temperature is 280 degrees F as indicated by In-core Thermocouples
    - Pressurizer level indicates 30%
    - RCS pressure is 350 psig
    - 11 Residual Heat Removal (RHR) Pump is operating and all RCPs are OFF
    - Loops 11 and 12 cold leg temperatures are 285 degrees F
    - Steam Generator secondary temperatures are 330 degrees F

    Which one of the following correctly describes the anticipated RCS pressure response and the reason for that response if the 12 RCP is started?

    a. Rises due to heating the RCS fluid as it passes through the Steam Generators.

    b. Lowers due to higher temperature loop water being cooled as it passes through the core region.

    c. Lowers because Pressurizer spray is initiated via bypass flow.

    d. Rises because letdown flow will be reduced.

19. Unit 1 is in Mode 5, with the following conditions:

- RCS pressure is 120 psig
- Seal inlet temperatures, and #1 seal leakoff temperatures are approaching their alarm setpoints
- 11-14 CV104, #1 seal leakoff valves are open, but leakoff flowrates range from 0.4-0.8 gpm
- Total seal injection flow is 22 gpm

Which one of the following correctly describes a condition that must exist before the combined #1 seal leakoff bypass valve, 1CV114, may be opened per S1.OP-SO.RC-0001(Q), "Reactor Coolant Pump Operation"?

a. Seal leakoff flow must be raised to > 1 gpm for each pump.

b. RCS pressure must be reduced below 100 psig.

c. Seal injection flow must be greater than 6 gpm to each RCP.

d. CCW must be available to all RCP Thermal Barrier Hxs.

20. Which one of the following correctly describes the reason that a minimum of 200 psid across the RCP seals is required for RCP operation?

a. Prevents physical contact between the thermal barrier Hx and the seal package.

b. Ensures that adequate seal cooling flow from the RCS is available.

c. Prevents the #1 RCP seal from swapping from a face rubbing to a film riding seal.

d. Prevents the weight of the seal ring from limiting cooling flow through the seal gap.

21. Unit 2 is at 100% power with all systems in normal alignment and 21 Charging Pump in service. Due to a failure of the Master Flow Controller, the charging flow control valve, 2CV55 has gone to the minimum flow position.

Which one of the following correctly describes the flow into the RCS?

a. All pump flow will be through the mini flow valves CV139 and CV140.

b. All flow will be to the charging header.

c. All flow will be to the RCP seals.

d. Reduced flow to the charging header and RCP seals.

22. The following plant conditions exist:

- Reactor power: 70%
- Rod control: AUTOMATIC
- Letdown flow: 40 GPM

2CC71, LETDOWN HEAT EXCHANGER TEMPERATURE CONTROL VALVE, fails to the full closed position due to a temperature sensor failing low.

Which one of the following correctly describes the plant response to this event?

a. VCT temperature rises causing a reduction in charging pump NPSH.

b. Letdown flow increases due to decreasing backpressure.

c. RCS boron concentration will slowly rise with the CVCS demineralizers bypassed.

d. Pressurizer level will rise and VCT level will lower when CV7 closes.

23. A Large Break LOCA has occurred on Unit 2. All equipment started normally except the 21 RHR pump which tripped on overcurrent.

Which one of the following correctly describes all the ECCS Pump suctions that are supplied from the discharge of the 22 RHR Pump following completion of the transfer to Cold Leg Recirculation?

a. 21 and 22 Charging Pumps, and 22 SI Pump.

b. 21 and 22 Charging Pumps, and 21 and 22 SI Pumps.

c. 22 Charging Pump and 22 SI Pump.

d. 21 and 22 Charging Pumps.

24. Which one of the following correctly describes an AUTOMATIC action that occurs when RWST level is <15 ft after a large break LOCA on Unit 2?

a. RHR to SI suction valves (SJ45) OPEN.

b. SI pump miniflow valve (SJ67, SJ68) CLOSE.

c. SI to Charging Pump Crossover Valves (SJ113s) OPEN.

d. RWST to Charging Pump suction valves (SJ1, SJ2) CLOSE.

25. During a Unit 1 cooldown per S1.OP-IO.ZZ-0006, PS1 malfunctioned. The following temperatures and pressures were observed during a review of P250 trends:

Time	T cold	RCS pressure
0940	510 F	1700 psig
1000	500 F	1750 psig
1020	490 F	1850 psig
1040	483 F	1950 psig
1100	475 F	1850 psig
1120	470 F	1785 psig

Assume NO operator action occurred between 0940-1120 and all appropriate actions were taken per S1.OP-IO.ZZ-0006 prior to 0940.

In accordance with S1.OP-IO.ZZ-0006, which one of the following correctly describes the appropriate operator action if the current trends continue?

a. Continue cooldown, no problem exists.

b. Continue cooldown, but reduce cooldown rate.

c. Stop the cooldown. Depressurize to 1500 psig to comply with pressure-temperature limits.

d. Stop the cooldown and depressurization and block the low pressure SI.

26. Given the following conditions on Unit 2:

    - RCS Tavg - 305 F and stable
    - PRT parameters
        - Pressure - 3.5 psig
        - Level - 70%
        - Temperature - 98 F

    One hour later when PRT PRESS HI (CC2) alarmed, the operator noted the following PRT parameters:

    - Pressure - 10.2 psig
    - Level - 81%
    - Temperature - 126 F

    Which one of the following correctly describes the conditions that resulted in the change in parameters?

    a. PRT to Vent Header Isol Valve 2PR15 failed closed.

    b. CVCS Letdown Relief Valve 2CV6 lifted.

    c. NT25, Nitrogen to the PRT was opened.

    d. PRT Water Supply Isolation Valve 2WR82 opened while filling RCP standpipes.

27. Which one of the following correctly describes the operation of the 2CC131, RCP Thermal Barrier Discharge Flow Control Valve?

    The valve will close on Phase B Isolation...

    a. and high flow if in AUTO.

    b. and high flow if in AUTO or MANUAL.

    c. if in AUTO, but will close on high flow if in AUTO or MANUAL.

    d. if in AUTO or MANUAL, but will close on high flow only if in AUTO.

28. The following plant conditions exist:

    - Steady state operation at 100% power
    - The PZR Pressure Master Controller is in AUTO with I&C testing in progress
    - Assume Pressurizer pressure control remains in automatic

    Which one of the following correctly describes the IMMEDIATE automatic response of the system if a Technician error results in a step change in the Master Pressure Controller setpoint to 2360 psig?

    a. Power operated relief valves PR1 and PR2 open and spray valves close.

    b. Power operated relief valve PR1 opens and spray valves open.

    c. Spray valves close and Pressurizer heaters energize.

    d. Spray valves open and Pressurizer heaters de-energize.

29. Unit 1 is in Mode 5 performing steps to draw a bubble in the Pressurizer. The following steps have been completed:

    - The Pressurizer is filled as indicated on the cold calibrated level channel
    - All Pressurizer heaters have been energized
    - Pressure is controlled at approximately 65 psig

    The next major action is to manually open PR1 & PR2 for 10-15 minutes when the Pressurizer reaches approximately 300 degrees F.

    Which of the following correctly describes the reason for opening PR1 & PR2?

    a. Required as part of the operability check for PR1 & PR2.

    b. Verification that the PORV tailpipe temperature device will respond to changes in temperature.

    c. Establishes flow from the RCS into the Pressurizer to ensure boron concentrations are equalized.

    d. Provides a flowpath for venting non-condensable gases out of the Pressurizer

30. The following plant conditions exist:

- Unit 1 is at 100% power
- Pressurizer Level Channel 1 is selected for control
- Pressurizer Level Channel 2 is selected for alarm
- Pressurizer Level Channel 2 fails LOW

Which one of the following correctly completes the description of the immediate plant response assuming no operator intervention?

Charging flow...

a. does NOT change, letdown isolates, and ALL Pressurizer Heaters shut off.

b. will rise to maximum, letdown isolates, and ONLY Backup Pressurizer Heaters shut off.

c. will rise to maximum, letdown isolation does NOT occur, and ALL Pressurizer Heaters shut off.

d. does NOT change, letdown isolation does NOT occur, and ONLY Backup Pressurizer Heaters shut off.

31. Given the following plant conditions:

- Unit 1 is at 100% power
- Containment pressure Channel I indication becomes erratic
- The channel is removed from service in accordance with S1.OP-SO.RPS-0005.

Which one of the following correctly describes plant response if Containment Pressure Channel IV subsequently fails high?

a. No response other than channel related alarms.

b. An AUTO SI actuation on 2/3 channel tripped.

c. AUTO SI, Containment Spray, Main Steamline Isolation and Phase B Isolation all actuate.

d. Main Steamline Isolation and Phase B Isolation. Containment Spray valves reposition but the Containment spray pumps do not start.

32. RCS pressure has decreased to 1859 psig during a plant cooldown. Appropriate actions have been taken as required by S2.OP-IO.ZZ-0005, Minimum Load to Hot Standby. Subsequently, a large steamline break occurs downstream of the MSIVs.

    Which one of the following correctly describes the ESF response to this break?

    a. No SI or Main Steamline Isolation will occur.

    b. BOTH a Main Steamline Isolation and an SI will occur.

    c. A Main Steamline Isolation will occur, but an SI will NOT occur.

    d. An SI will occur, but a Main Steamline Isolation will NOT occur.

33. A valid Safety Injection (SI) signal is generated while a Blackout sequence is in progress.

    Which one of the following correctly completes the description of SEC operation?

    The MODE II sequence will...

    a. reset, and the MODE I Sequence starts.

    b. restart, and the MODE I Sequence is blocked.

    c. terminate and reset, loads started will be stripped and the MODE III sequence will load appropriate ECCS equipment.

    d. continue to completion, and then the MODE III Sequence will load appropriate ECCS equipment.

34. Unit 2 was operating at 100% power when an automatic Safety Injection occurred due to a high steamline flow coincident with LO-LO Tave. The following conditions now exist:

- The leak has been isolated
- All SI signals have been cleared
- Reactor Trip Breaker A failed to open and remains closed
- An I&C Technician has completed installing the P-4 jumper for Reactor Trip Breaker A in accordance with the respective I&C procedure
- All SI and RHR Pumps are stopped
- 21 CVC Pump is running and the BIT is isolated in accordance with EOP-TRIP-3, SI Termination

Which one of the following correctly describes Safety System response if a Pressurizer safety valve fails open and RCS pressure lowers below the automatic SI setpoint?

a. SI automatically initiates only from Train A.

b. SI automatically initiates only from Train B.

c. SI automatically initiates from both Train A & B.

d. MANUAL SI must be initiated or equipment must be started/aligned individually.

35. Given the following:

- Unit 1 is operating at 30% steady state reactor power.
- I&C technician receives permission to perform a calibration on PR N-41.
- The I&C technician mistakenly pulls the fuses on N-42, realizes the mistake and immediately reinserts the fuses for N-42 and pulls the fuses for the correct channel, N-41.

Which one of the following correctly identifies the actions that occur after the technician pulls the fuses for N41?

a. High power rod stop

b. PR rate trip

c. PR neutron flux high setpoint trip

d. Only expected alarms for N41

36. Intermediate Range (IR) compensating voltage fails LOW on one of the IR detectors. The reactor subsequently trips due to other causes, but the IR current on the failed detector does NOT go below 5.0 E-5 amps.

Which one of the following items correctly describes how the source range instruments will be energized as reactor power decreases below 7.0 E-11 amps?

a. P-6 will be unblocked and the source range detectors will automatically reenergize.

b. The failed IR detector will be bypassed allowing the source range detectors to energize.

c. The source range manual reset pushbuttons will be used to manually reenergize the source range detectors.

d. One source range detector will automatically reenergize and the other will be manually re-energized using the reset pushbuttons.

37. The plant is shutdown in Mode 5 with RCS temperature at 100 degrees F. RCS pressure control is in a normal lineup for the current RCS pressure and temperature.

The following control board indications are noted:

- POPS INITIATED PRESSURE HI Bezel Alarm for Channel I
- CHANNEL I PRESSURE HI Bezel Alarm for Channel I
- PR1 NOT FULL CLSD OHA E-6
- PR1 indicates open

Which one of the following correctly identifies the transmitter that will give the above indications when it fails HIGH?

a. PT403

b. PT405

c. PT456

d. PT474

38. Unit 2 is operating at 100% power and has experienced a LOCA. The CET Display for the hottest in-core thermocouple reading is 688 degrees F. Temperature in the area of the reference junction boxes for the thermocouples is 100 degrees higher than it was prior to the LOCA.

Which one of the following correctly describes how the CET readings are affected by the temperature change in the area of the reference junction boxes?

The thermocouple readings will:

a. read lower due to lower voltage differential between metals at the cold junction.

b. read higher due to higher voltage differential between metals at the cold junction.

c. remain the same because the reference junction boxes are thermally insulated

d. remain the same because the temperature change is compensated for by the CET processor.

39. Given the following:

- Both Units are at 100% power
- All systems are normally aligned
- A loss of off-site power occurs

Which one of the following correctly completes the description of the response of the Containment Fan Cooling Units (CFCUs)?

The CFCUs are tripped and...

a. must be manually restarted.

b. one CFCU is started on each bus in high speed.

c. then sequenced onto the safety-related electrical buses in the slow speed mode.

d. then sequenced onto the safety-related electrical buses in normal high speed mode.

40. Which one of the following describes the flowpath through the Containment Fan Coil Units during a LOCA?

    a. Low speed flow through demister, then HEPA filter, then charcoal filter, then cooling coils.

    b. Low speed flow through demister, then roughing filter, then HEPA filter, then cooling coils.

    c. Low speed flow through demister, then HEPA filter, then cooling coils.

    d. Low speed flow through roughing filter, then demister, then cooling coils, then HEPA filter.

41. Which one of the following correctly describes the protection specifically designed to prevent a spurious actuation of Containment Spray (CS) as a result of a loss of power or a voltage fluctuation?

    a. A normally OFF key switch is provided in the CS pump start circuitry.

    b. The CS bistables energize to trip on Hi-Hi Containment Pressure.

    c. The CS bistables are powered from 125 VDC battery buses.

    d. An SI signal must be present for CS to actuate.

42. A Large Break LOCA has occurred. The 21 RHR pump has tripped on Overcurrent. The Recirculation phase is being implemented with Containment Spray required. The following conditions are noted:

    - RWST level is at the LO LO alarm setpoint
    - The second Containment Spray pump has been stopped
    - The sump to RHR isolation valve 21SJ44 is CLOSED
    - The sump to RHR isolation valve 22SJ44 is OPEN
    - The RCS to RHR isolation valve 2RH1 is OPEN
    - The RCS to RHR isolation valve 2RH2 is CLOSED

    Which one of the following correctly describes the response of the RHR to CS System isolation valves 21CS36 and 22CS36 when their respective Open Pushbutton is depressed?

    a. Both valves will OPEN.

    b. Neither valve will OPEN.

    c. 21CS36 will OPEN and 22CS36 will NOT OPEN.

    d. 21CS36 will NOT OPEN and 22CS36 will OPEN.

43. Which one of the following correctly identifies the mechanisms for gaseous iodine removal from containment atmosphere?

    a. Iodine Removal Units both during accident conditions and during normal conditions.

    b. Containment Spray during accident conditions, and Iodine Removal Units during normal conditions.

    c. Containment Spray and Iodine Removal Units during accident conditions, and neither during normal conditions.

    d. Containment Spray and Iodine Removal Units during accident conditions, and Iodine Removal Units during normal conditions.

44. Containment Purge operations are in progress during MODE 5 operations. The following conditions are noted:

    - 1R41D was determined to be inoperable prior to the start of the purge operation
    - 1R12A is being continuously monitored

    Which one of the following correctly describes conditions that will require immediate MANUAL termination of the purge operation in accordance with the Containment Purge to Plant Vent procedure, S1.OP-SO.WG-0006?

    a. A downscale failure of 1R12A.

    b. A downscale failure of 1R11A.

    c. 1R12B becomes inoperable.

    d. 1R11A becomes inoperable during the purge operation.

45. Unit 1 Spent Fuel Cooling System requires cross-connecting to Unit 2 Spent Fuel Cooling System to support maintenance activities.

    Which of the following statements correctly describes the flowpaths associated with this evolution?

    a. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling Pumps and Heat Exchanger.

    b. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling Pumps using Unit 1 Spent Fuel Cooling Heat Exchanger.

    c. Unit 2 Spent Fuel Cooling System provides limited cooling to both Unit 1 & Unit 2 Spent Fuel Pits.

    d. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling System Heat Exchanger using Unit 1 Spent Fuel Cooling Pumps.

46. The Unit 2 Advanced Digital Feedwater Control System (ADFWCS) average steam pressure calculation output has failed.

    Which one of the following correctly describes the expected response of the Feedwater Control System?

    a. Only 21-24BF19 valves will switch to manual control mode.

    b. Only SGFP controllers will switch to manual control mode.

    c. Only 21-24BF19 and BF40 valves will switch to manual control mode.

    d. The 21-24BF19s, BF40s and both feed pump controllers will switch to manual control mode.

47. The following plant conditions exist:

    - Plant is operating at 55 percent power with all systems normally aligned
    - One main steam code safety valve fails full open
    - The plant continues to operate

    Which one of the following correctly describes the approximate power level the plant will stabilize at if the valve remains OPEN and no operator action is taken?

    a. 57.5 percent.

    b. 60.5 percent.

    c. 65 percent.

    d. 75 percent.

48. Given the following conditions on Unit 2:

- Reactor power was 65% when the turbine tripped and an ATWS occurred
- The reactor tripped 20 seconds later when Train A reactor trip breaker was locally opened
- Train B reactor trip breaker is failed closed
- No controls other than control rods and boration controls have been operated

Which one of the following correctly describes the operation of the steam dumps for these conditions?

Steam Dumps will…

a. open immediately following the turbine trip and modulate to stabilize Tavg at its no-load value.

b. open when the trip breaker is opened and modulate to stabilize Tavg at its no-load value.

c. open immediately following the turbine trip and modulate to stabilize Tavg 5 degrees above its no-load value.

d. open when the trip breaker is opened and will be blocked closed when Tavg falls below its low-low value.

49. The following conditions exist on Unit 2:

- Reactor power 30%
- Turbine EHC Panel settings:
  - Turbine SETTER & REFERENCE - 36
  - IMP IN is selected
- Turbine Valve Position Limiter is set at the 100% power value
- The turbine impulse pressure channel input to EHC slowly fails to zero

Which one of the following correctly describes the response of the EHC controls to these conditions?

Turbine load will...

a. remain constant. When the difference between REFERENCE and the input signal exceeds the setpoint, EHC will transfer to MANUAL control.

b. increase until the difference between REFERENCE and the input signal exceeds the setpoint, then load will stabilize in IMP OUT control.

c. increase until the difference between REFERENCE and the input signal exceeds the setpoint, then an alarm will alert the operator to select IMP OUT control.

d. remain constant. When the difference between REFERENCE and the input signal exceeds the setpoint, an alarm will alert the operator to select MANUAL control.

50. Unit 2 is at 50% power. 21 SGFP is manually tripped. 22 SGFP subsequently trips on a loss of Lube oil.

Which one of the following correctly describes the status of the Aux Feedwater Pumps?

a. The motor driven AFW Pumps immediately start when the 22 SGFP trips.

b. The motor driven AFW Pumps will not start until S/G levels drop below 9%.

c. All AFW pumps auto start only if the jumpers were installed in the 21 SGFP trip circuit.

d. All AFW Pumps immediately start when the 22 SGFP trips.

51. The following is a list of conditions that will result in SGFP trips.

    Which condition will trip both SGFPs simultaneously?

    a. Condenser vacuum decays to 20" Hg.

    b. Main Turbine trip with power at 83%.

    c. Containment pressure rises to 4.4psig.

    d. Inadvertent actuation of the Feedwater Interlock.

52. The reactor is at full power. Auxiliary Feedwater pump 23 LOCAL/REMOTE switch has been inadvertently left in LOCAL at the Hot Shutdown Panel.

    Which one of the following correctly describes the consequences of this error?

    The 23 AFW Pump will start...

    a. if both SGFPs trip.

    b. when actuated by an AMSAC signal.

    c. on a loss of 125VDC control power.

    d. if the START pushbutton in the control room is operated.

53. A failure of the Reactor Protection System has occurred following the loss of the only available feed pump with reactor power at 50%. Steam Generator narrow range levels are off-scale low.

    Which one of the following correctly describes the plant response due to AMSAC actuation?

    a. All AFW pumps start and the main turbine trips 25 seconds after 3 of 4 S/G levels go below 5%.

    b. All AFW pumps start immediately after 3 of 4 S/G levels go below 5%.

    c. Main Turbine trips immediately and all AFW Pumps start 25 seconds after 3 of 4 S/G levels go below the reactor trip setpoint.

    d. All AFW Pumps start and the Main Turbine trips immediately after 3 of 4 S/G levels go below the reactor trip setpoint.

54. Given the following conditions:

- Unit 1 is in MODE 3
- Unit 2 reactor power - 18%
- The Main Generator is synchronized to the grid
- Steam Dumps are closed.
- 21A, 22A and 23A Circulators have tripped.

Which one of the following correctly identifies the failure which would cause the simultaneous trip of these Circulators?

a. An undervoltage condition lasting 0.2 seconds on 2CW Bus Section 23.

b. 3 SPT Differential Overcurrent.

c. Breaker failure on 500 kV BS 9-10 (30X) breaker.

d. Phase to Ground fault on the Salem 2CW 4KV Bus Section 23.

55. Which one of the following correctly describes the normal flowpath for power to the 115 Vital Instrument Bus D on Unit 2?

a. DC power from the 2B 125 VDC Bus rectified to 120 VAC.

b. AC power from 2C 230 VAC Vital Bus transformed to 120 VAC.

c. AC power from the 2B 230 VAC Vital Bus, rectified to 140 VDC inverted to 120 VAC.

d. AC power from 2C 230 VAC, stepped down to 140 VAC to the AC Line Regulator and reduced to 120 VAC.

56. 125 VDC breaker 2BDC1AX12, 2G 4KV Bus Control Power Supply (Reg) tripped due to a breaker malfunction.

Which one of the following correctly describes the impact this malfunction will have?

a. 24 RCP will trip immediately.

b. 24 RCP will remain running but will not trip if required.

c. Emergency control power from the 2A 125 VDC bus will automatically be provided.

d. 24 RCP breaker will trip if required but will not close to start the pump.

57. Given the following conditions on Unit 2:

- The 2A 4KV Vital bus experienced a loss of bus voltage
- The 2A EDG energized the 2A 4KV bus
- The SEC sequenced loads in accordance with MODE II*
- The normal source to the bus is now available

Which one of the following correctly completes the description of the method for restoration of the normal power supply to the 2A 4KV Vital Bus in accordance with S2.OP-SO.DG-0001, 2A DIESEL GENERATOR OPERATION?

The EDG is...

a. unloaded in Isochronous Mode and removed from the bus before the normal feeder breaker is closed.

b. unloaded in Isochronous Mode, placed in parallel with the normal feeder breaker closed and then removed from the bus.

c. transferred to Droop Mode, placed in parallel with the normal feeder breaker closed and then removed from the bus.

d. transferred to Droop Mode when the SEC is reset, unloaded and removed from the bus before the normal feeder breaker is closed.

58. A steamline break inside containment and loss of off-site power have occurred on Unit 1. All D/Gs are running loaded in SEC Mode 3. All required equipment started and the crew has implemented 1-EOP-TRIP-1, Reactor Trip or Safety Injection. The SECs have not been reset. OHA alarm J-20, 1C DG URGENT TRBL and console bezel alarm 1C TROUBLE have actuated. The NEO dispatched to investigate reports the local annunciator panel alarm is HIGH LUBE OIL TEMPERATURE and Lube oil temperature is 208 degrees F.

Which one of the following is the correct response for this situation?

a. Direct an NCO to block 1C SEC on the RP-1 Panel to avoid losing 1C 4KV Vital Bus when 1C SEC is reset in the EOPs.

b. Direct the NEO to investigate and attempt to correct the problem. 1C 4KV Vital Bus will be lost if the SEC is reset with this problem standing.

c. Direct the NEO to push the local EMERGENCY TRIP pushbutton. 1C EDG should have tripped automatically.

d. Direct the NEO to trip 1C EDG at the fuel rack. The local EMERGENCY TRIP is not functional on a SEC start.

59. Which one of the following correctly describes the condition that will cause the Steam Generator Blowdown Isolation Valves (GB4) to CLOSE on the Unit 2 Steam Generators?

    a. Auto start of Auxiliary Feed Pumps.

    b. High setpoint reached on any Main Steam Line Monitor, 2R46A-E.

    c. High setpoint reached on Condenser Air Ejector Monitor, 2R15.

    d. Warning on Steam Generator Blowdown Monitor, 2R19.

60. Which one of the following correctly completes the description of the condition that ensures release limits are NOT exceeded when discharging the contents of a WGDT?

    The Radioactive Gaseous Waste Release Valve (WG41)...

    a. will close when pressure exceeds 2.9 psig upstream of WG41.

    b. will close when pressure exceeds 5.3 psig downstream of WG41.

    c. must be throttled by the operator to limit the discharge flowrate to 32 scfm during the release.

    d. is designed to limit the discharge flowrate to 32 scfm when the valve is full open.

61. Which one of the following Radiation Monitors initiates safety related actions?

    a. WGDT (R42) Alarm.

    b. Control Room (R1A) Alarm.

    c. Containment Low Range (R2) Alarm.

    d. Fuel Handling Building-Spent Fuel Pit Area (R5) Alarm.

62. Which one of the following correctly describes the response of the GB4's (S/G Blowdown Outlet Isolation Valves) to a rising radiation condition on only Unit 1 or Unit 2 R19D, Steam Generator Blowdown Liquid Monitor, for 14 or 24 SG?

    a. On Unit 1, only 14GB4 will close on a warning condition.
    On Unit 2, all GB4 valves will close on an alarm condition.

    b. On Unit 1, all GB4 valves will close on an alarm condition.
    On Unit 2, only 24GB4 will close on an alarm condition.

    c. On Unit 1, only 14GB4 will close on a warning condition.
    On Unit 2, all GB4 valves will close on a warning condition.

    d. On Unit 1, all GB4 valves will close on a warning condition.
    On Unit 2, only 24GB4 will close on an alarm condition.

63. Which one of the following correctly describes the protective feature for the CFCUs Service Water System on Unit 1 for a loss of off-site power?

    a. A travel stop on closing for SW-223, Outlet flow control valve, protects the piping from overpressure.

    b. A bypass line with orifices installed around SW-223, Outlet flow control valve, protects the piping from overpressure.

    c. A relief valve installed around SW-223, Outlet flow control valve, mitigates waterhammer when SW flow is re-initiated.

    d. A SW accumulator installed just upstream of SW-223, Outlet flow control valve, maintains CFCU Flow until Service Water Pumps are started by the Blackout sequencer.

64. A rupture of the A Control Air header has occurred downstream of the supply from the Control Air Dryer and has resulted in lowering air pressure.

    Which one of the following correctly completes the statement concerning operation of the 1CV3,4,5, Letdown Orifice Isolation Valves, on Unit 1 during this event?

    The 1CV3,4,5, Letdown Orifice Isolation Valves, will be supplied adequate air for control due to...

    a. auto start of #3 Station Air Compressor on Unit 2.

    b. auto start of the Unit 1 Emergency Control Air Compressor.

    c. actuation of the Excess Flow Check Valve (EFCV) 1CA920.

    d. swap of the 1CV3,4,5, Letdown Orifice Isolation Valves Redundant Air Panel (Lunkenheimer) to the B header.

65. Unit 2 is at the end of life with the following conditions:

- A plant startup is in progress
- Reactor power - 8%
- RCS boron concentration 100 ppm
- Control Bank D is at 138 steps
- Circuit failure at the RAISE RODS pushbutton results in outward rod motion

Which one of the following correctly identifies the condition that will terminate the power increase if NO operator action is taken?

a. Power Range High Flux HI setpoint trip.

b. Power Range High Flux LO setpoint trip.

c. C-11, Control Bank D Fully Withdrawn Rod Stop.

d. C-1, Intermediate Range High Flux Rod Withdrawal Stop.

66. Given the following conditions on Unit 2:

- A reactor startup is in progress
- All Shutdown Bank rods are fully withdrawn
- Control Banks A, B are fully withdrawn
- Control Bank C is being withdrawn at 210 steps
- Control Bank C rod H-14 dropped due to a fuse failure

Which one of the following correctly completes the statement about the status of the ROD BANK URGENT FAIL alarm (OHA E-40)?

The alarm actuates...

a. after the fuse failed and rod motion was commanded.

b. only when the rod is being recovered.

c. only after H-14 clears 20 steps during recovery operations.

d. as soon as the rod was misaligned from the bank by at least 12 steps.

67. Operators are performing the actions of 2-EOP-LOCA-2 "POST LOCA COOLDOWN AND DEPRESSURIZATION". A Pressurizer PORV is opened to de-pressurize the RCS to fill the Pressurizer. No RCPs are operating.

Which one of the following correctly describes the basis for stopping the depressurization when Pressurizer level is above 33%?

a. Prevents isolation of CVCS letdown when a RCP is started.

b. Ensures RCS subcooling is maintained when SI flow reduction is initiated.

c. Maintains Pressurizer level above the SI reinitiation criteria when a RCP is started.

d. Provides adequate Pressurizer level to maintain Pressurizer heaters operable as RCS voids collapse.

68. Given the following conditions:

- 23SJ54 is closed due to high level in the accumulator caused by leakage past 23SJ55
- 23SJ54 is energized with the VALVE OPERABLE position selected on Panel 2RP4
- 23SJ29 has lifted and reduced nitrogen pressure to 675 psig
- 23 SI Accumulator level is 78%

In accordance with UFSAR accident analysis, which one of the following correctly states the response of the 23 SI Accumulator if a Design Basis LOCA occurs on the 22 Loop Cold Leg, at this time?

a. 23SJ54 automatically opens and 23 SI Accumulator will deliver a greater volume of water than design.

b. 23SJ54 automatically opens and 23 SI Accumulator will deliver a smaller volume of water than design.

c. 23SJ54 must be opened by the Control Room Operators and will deliver a greater volume of water than design.

d. 23SJ54 must be opened by the Control Room Operators and will deliver a smaller volume of water than design.

69. A LOCA has occurred on Unit 2.

Which one of the following correctly identifies the reason RCPs are stopped if containment pressure exceeds 15 psig?

a. RCP motor bearings will be damaged.

b. RCP seal flow cooling is lost.

c. RCP control may be lost since the electrical insulation is NOT qualified.

d. Continued RCP heat input will contribute to containment pressure exceeding design limits.

70. The following conditions exist on Unit 2:

- Reactor power - 100% power for 4 months
- 24 RCP trips resulting in a reactor and turbine trip
- Plant stabilizes with steam dumps controlling at no-load Tavg

Which one of the following correctly completes the description of 24 SG pressure and steam flow parameters as compared with those of the unaffected loops?

24 SG pressure will be…

a. lower and steam flow will be lower.

b. the same and steam flow will be lower.

c. the same and steam flow will the same.

d. higher and steam flow will be the same.

71. Given the following Unit 2 conditions:

- Reactor power - 100%
- No dilutions or borations in progress
- VCT level transmitter, 2LT-114, fails HIGH

Which one of the following correctly completes the description of what occurs if NO operator action is taken?

VCT level...

a. lowers when CV35 diverts to the HUT.

b. rises until CV35 modulates to HUT and maintains VCT level.

c. lowers faster than auto makeup capability causing charging suction to shift to the RWST.

d. lowers with NO auto makeup capability causing charging suction to shift to the RWST.

72. Given the following for Unit 2:

- The reactor was shutdown 220 hours ago after extended power operation
- RCS Tavg - 155 F
- Pressurizer level - 20%
- RHR flow was 1600 gpm
- Time to core boiling is approximately 15 min.
- The 21 RHR Pump is available for immediate start

22 RHR Pump was in service for cooldown but has been stopped due to indications of cavitation. S2.OP-AB.RHR-0001, Loss of RHR has been entered.

In accordance with S2.OP-AB.RHR-0001, Loss of RHR, which one of the following correctly describes the action(s) required for this situation?

a. A normal restoration and venting of the entire RHR System.

b. Start any RHR pump and cycle the RH18s to rapidly change flow and sweep voids away.

c. 21 or 22 RHR pump shall be started at full flow to sweep voids away.

d. The 21 RHR Pump shall be started with suction from the RWST for adequate NPSH.

73. Which one of the following correctly identifies the leak location that would result in the fastest rate of level rise in the CCW Surge Tank? (Assume the size of the leak is equal at 0.25 square inches for each component.)

    a. 21 RHR Heat Exchanger with RHR providing shutdown cooling.

    b. 21 CCW Heat Exchanger aligned for cooling, at power.

    c. No. 2 Spent Fuel Pit Heat Exchanger when in service, at power.

    d. No. 2 Excess Letdown Heat Exchanger when in service, at power.

74. Following a cooldown caused by a Steam Dump malfunction, Pressurizer level fell below 17% and was rapidly restored by increasing charging flow. Pressurizer pressure also fell to 2185 psig.

    Which one of the following correctly identifies the reason why the pressure recovery from 2185 psig takes a longer time for this event, than it does if a PORV fails open and the PORV block valve was closed at 2185 psig?

    a. The volume of steam generation and cooling is greater with the level change.

    b. Subcooled water insurge during refill reduced the Pressurizer liquid space temperature.

    c. When the PORV opens, only the steam space needs to be reheated to raise pressure.

    d. The heaters are less effective since they had tripped off and cooled off on low PZR level.

75. Given the following conditions for Unit 2:

- 21 Charging Pump is in service
- Reactor power - 100%
- CVCS parameters:
  - Letdown flow (FI-134) - 75 gpm
  - Charging flow (FI-128B1) - 87 gpm
  - Total seal injection flow (FI-115, 116, 143, 144) - 33 gpm
- Controlling Pressurizer level channel LT-459 fails low

Assuming NO operator action is taken, which one of the following correctly completes the description of the effect of the Pressurizer Level Channel failure on total seal injection flow?

Total seal injection flow will...

a. be off-scale high on CC2 indication.

b. decrease to about 20 gpm.

c. remain at 33 gpm.

d. increase to no more than 40 gpm.

76. An ATWS has occurred on Unit 2 and actions are being taken in accordance with 2-EOP-FRSM-1 "Response to Nuclear Power Generation." The operator initiated rapid boration flow by starting both Boric Acid Pumps, opening 2CV175 Rapid Borate Stop Valve, and closing 21 and 22CV160 BAT Recirc valves.

The following conditions exist:

- Reactor power - 3% ; SUR just negative
- RCS temperature (Tavg) - 550 F
- Pressurizer pressure - 2340 psig & rising slowly
- Pressurizer level - 29% & lowering slowly
- Control rods being inserted in MANUAL; Control Bank D is fully inserted
- Turbine is tripped
- Charging flow (FI128B) - 52 gpm
- Boration flow (FI113A) - 35 gpm

In accordance with 2-EOP-FRSM-1, Response to Nuclear Power Generation, which one of the following correctly describes the action the operator shall take to increase the boration rate?

a. Manually actuate Safety Injection.

b. Locally open 2CV-174, Manual Boration Valve.

c. Close 2CV40 and 2CV41, the VCT Discharge Stop Valves.

d. Open a Pressurizer PORV and its associated PORV Stop Valve.

77. The following conditions exists on Unit 2:

- Plant shutdown is in progress
- All power range channels indicate 6% reactor power
- Intermediate range channel N36 fails HIGH

Which one of the following correctly completes the description of the plant response to this failure?

The reactor will...

a. NOT trip, but the Source Range channels will NOT automatically reinstate if the plant trips.

b. trip on high IR flux, and Source Range channels will NOT automatically be reinstated.

c. trip on high IR flux, and Source Range channels are automatically reinstated when N35 decreases to P6.

d. NOT trip, but the Source Range channels will automatically be reinstated if the plant trips.

78. Given the following conditions on Unit 2:

- Primary to secondary leak has been diagnosed in the 21 S/G
- Operators are performing actions of S2.OP-AB.SG-0001(Q) "STEAM GENERATOR TUBE LEAK"
- Unit cooldown from Hot Shutdown conditions has been commenced
- 21 SG has been isolated

Which one of the following correctly identifies the radiation monitor that would be used to continue trending of the primary to secondary leak rate?

a. Main Steam Line Monitor 2R46A.

b. Main Steam Line Process (N-16) Monitor 2R53A.

c. Steam Generator Blowdown Liquid Monitor 2R19A.

d. Condenser Air Removal and Priming System Process Monitor 2R15.

79. Given the following conditions on Unit 2:

- A SGTR has occurred on the 22 S/G
- 2-EOP-SGTR-2 "POST SGTR COOLDOWN" is the procedure in effect
- 23 RCP is running
- During backfill operations, the Plant Operator mistakenly allows 22 S/G Narrow Range level to go off-scale low

Which one of the following correctly identifies a negative consequence of this mistake?

a. S/G depressurization will occur reinitiating primary-to-secondary leakage.

b. Primary dilution from the excess SG back leakage will result in a transition to 2-EOP-FRSM-2.

c. Pressurizer level will fall below the minimum value resulting in automatic starting of SI Pumps.

d. Heat removal from the RCS is reduced such that the optimal cooldown rate CANNOT be maintained.

80. While attempting to identify a ruptured S/G in accordance with 2-EOP-SGTR-1, Steam Generator Tube Rupture, the Reactor Operator notes that RCS pressure has dropped to 1330 psig, even with maximum ECCS flow.

Which one of the following correctly states why the operator is required to trip the RCPs under these conditions?

a. Minimize heat transfer to the ruptured S/G.

b. Ensure against possible misdiagnosis, operator error, or multiple events.

c. Ensure natural circulation is established prior to pressure equalization steps.

d. Minimize the likelihood of RCS voiding impeding heat transfer to the intact S/Gs.

81. The following conditions were observed while Unit 2 was operating at 100% power:

- Pressurizer level lowering rapidly at 42%
- Pressurizer pressure lowering rapidly at 2100 psig
- All S/G pressures lowering at 682 psig
- 2R11A indication is normal and not changing
- Containment pressure is 2 psig and rising
- Reactor power is 103%

Choose the statement below that correctly describes these conditions:

These conditions are caused by:

a. a LOCA inside containment.

b. a S/G safety valve opening.

c. a Steam Line Break downstream of 21MS167.

d. a Steam Line Break upstream of the Main Steam Line flow element.

82. A rapid loss of condenser vacuum has occurred due to a leak in the condenser.

Which one of the following correctly identifies the first automatic function to occur as vacuum degrades?

a. Steam Generator Feed Pump trip.

b. Circulating Water Pump start permissive is lost.

c. Main Turbine Trip.

d. LP Turbine rupture disks break.

83. An electrical disturbance resulted in a loss of all Unit 2 Circulators and a reactor trip from 50% power. Significant decay heat causes RCS temperature to increase following the trip.

Which one of the following correctly identifies the temperature at which the RCS Tavg stabilizes 10 minutes after the trip?

a. 555 F, the value of the lowest set Main Steam Safety Valve.

b. 552 F, per the Steam Dump Load Rejection Controller.

c. 548 F, per the MS10, Main Steam Atmospheric Relief setpoint at 1015 psig.

d. 543 F, per the Steam Dump Plant Trip Controller.

84. Given the following conditions on Unit 2:

- A break has occurred on the Feedwater line to the 23 SG inside containment
- SI is actuated
- The following parameters are noted:
  - Pressurizer pressure - 1920 psig
  - Lowest Tavg - 544 F
  - Lowest S/G pressure - 980 psig (23)
  - Containment pressure 4.2 psig

Assuming no operator action has been taken, which one of the following correctly describes the expected S/G conditions?

a. Only the 23 S/G pressure would be decreasing from the break.

b. All S/G pressures would be decreasing from the break via interconnection of the Main Steam lines.

c. All S/G pressures would be decreasing from the break via interconnection of the Main Feedwater lines.

d. All S/G pressures would be decreasing from the break via interconnection of the Auxiliary Feedwater lines.

85. Which one of the following correctly completes the operator action concerning Safety Injection actuation in the event of an extended loss of all AC power?

The SI signal will be manually actuated...

a. and reset while the 4KV Vital buses are de-energized.

b. and reset after power is restored to at least ONE 4KV Vital bus.

c. only if automatic actuation is present and is reset while the 4KV Vital buses are de-energized.

d. only if an automatic actuation signal is present and is reset after power is restored to at least ONE 4KV Vital bus.

86. The following conditions exist on Unit 1:

- 1A 4KV Vital Bus is powered from 13 SPT
- 1B & 1C 4KV Vital Bus is powered from 14 SPT
- 1B Emergency D/G surveillance is being performed with the D/G paralleled to the bus and loaded to 2600 kW

An overcurrent condition results in the loss of the 14 Station Power Transformer.

Which one of the following correctly describes the final electrical alignment?

a. All busses are stripped and aligned to their respective D/G in accordance with Mode II SEC Loading.

b. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus swaps to the 13 SPT with the 1B D/G paralleled to the bus.
1C 4KV Vital Bus swaps to the 13 SPT.

c. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus swaps to the 13 SPT with the 1B D/G running and its output breaker open.
1C 4KV Vital Bus swaps to the 13 SPT.

d. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus is powered from the 1B D/G only.
1C 4KV Vital Bus swaps to the 13 SPT.

87. Power for the 2A Vital Instrument Bus transferred from the 2A Vital Instrument Inverter to AC Line Regulator due to a momentary overload on the Inverter.

    Which one of the following correctly identifies when the 2A Vital Instrument Bus will revert to the Inverter?

    a. Following rotation of the Static Switch to the INV position.

    b. When the Return Mode toggle switch is placed in MAN.

    c. Automatically as Inverter voltage rises.

    d. When the ALARM CONTACT RESET pushbutton is depressed.

88. During the performance of 2-EOP-LOPA-1, Loss of All AC Power, the operating crew is directed to implement AB.LOOP-0001, Loss of Off-Site Power, Attachment 1, Blackout Coping Actions. An operator is sent to place both Unit 3 engines in LOCKOUT and open the 125 VDC distribution panel main breaker.

    Which one of the following correctly describes the reasons for these actions?

    a. Unload the Unit 3 battery while the switchyard is prepared for the Unit 3 startup.

    b. Prepare the Unit 3 battery charger to feed into the station 125 VDC System.

    c. Reduce heat loads in the Jet Control House until power can be restored.

    d. Prevent Auto start of Unit 3 until the switchyard is prepared.

89. Given the following:

- All Unit 1 & 2 Circulating Pumps are in service
- Unit 1 is in Mode 3
- Unit 2 is at 100% power
- 21,23 & 26 Service Water Pumps are running
- 21 CVCS Monitor Tank is being released via 21 CCW Hx to the Circulating Water System

In accordance with S2.OP-SO.WL-0001, RELEASE OF RADIOACTIVE LIQUID WASTE FROM 21 CVCS MONITOR TANK, which one following correctly identifies the condition that would require termination of the liquid release?

a. The 21A & 21B Circulators trip.

b. The 11A & 11 B Circulators trip.

c. 21 CCW Pump trips.

d. 23 Service Water Pump trips and Service Water header pressure drops from 115 to 105 psig.

90. Unit 2 is operating at 100% power when a tube leak occurs in the 21 CCW HX.

Which one of the following correctly describes the consequence of this event?

a. RCPs may need to be tripped due to a reduction in CCW header pressure.

b. The Aux Building Exhaust System filters and in service Waste Holdup Tanks may become contaminated with chromates.

c. Chromates will be transported to the Delaware river by the Service Water System.

d. Components cooled by CCW will experience a reduction in cooling that could cause a plant shutdown.

91. The following conditions exist on Unit 2:

- A loss of Control Air has occurred
- The operators have tripped the reactor and stabilized the unit at no-load Tavg
- Restoration of air is expected to take up to TWO hours

Which one of the following correctly identifies the basis associated with the preferred CVCS pump operation during this time period?

a. Run 23 Charging Pump to provide the minimum RCS makeup.

b. Run 23 Charging Pump because CCP Flow Control Valve, CV55 failed closed.

c. Run any Centrifugal Charging Pump to provide more stable seal flow to the RCPs.

d. Run any Centrifugal Charging Pump because the mini-flow provides automatic pump protection.

92. In response to a fire found in the Aux Building Ventilation Charcoal Filters, the operators on BOTH units have actuated FIRE OUTSIDE THE CONTROL ROOM.

Which one of the following correctly describes the Control Area HVAC operation in this condition?

a. The Control Room Envelope (Zone 1) is recirculated through the Emergency Air Conditioning System (EACS) for the Unit which actuated first. The remaining Control Area Zones are recirculated through Control Area Air Conditioning System (CAACS) for the Unit which actuated first while the other CAACS provides outside air.

b. The Control Room Envelope (Zone 1) is recirculated through BOTH EACS. The remaining Control Area Zones are recirculated through CAACS for the Unit which actuated first while the other CAACS provides outside air.

c. The Control Room Envelope (Zone 1) is recirculated through EACS for the Unit which actuated first. The remaining Control Area Zones are recirculated through and provided outside air by BOTH CAACS.

d. The Control Room Envelope (Zone 1) is recirculated through BOTH EACS. The remaining Control Area Zones are recirculated through BOTH CAACS.

93. The operators are initiating seal injection to the RCPs in accordance with S2.OP-AB.CR-0002 "CONTROL ROOM EVACUATION DUE TO FIRE IN CONTROL ROOM, RELAY ROOM, OR CEILING OF THE 460/230V SWITCHGEAR ROOM".

Which one of the following correctly describes a requirement for establishing seal injection?

a. Control Air is available for control of 2CV55.

b. 125 Volt Vital DC is available for operation of the centrifugal charging pump breakers.

c. 230 volt AC power is available for operation of 2CV68 or 2CV69.

d. CCW is available for the thermal barrier heat exchangers.

94. Which one of the following correctly describes the reason for starting a RCP when performing 2-EOP-FRCC-1"Response to Inadequate Core Cooling"?

a. Facilitate rapid RCS depressurization using a normal Pressurizer Spray valve.

b. Improve heat transfer until additional makeup flow to the RCS can be established.

c. Allow the use of RVLIS dynamic head range for a better indication of RCS level.

d. Minimize the inventory loss by using two-phase heat transfer when rapidly depressurizing the S/Gs.

95. S2.OP-AB.RC-0002, HIGH ACTIVITY IN REACTOR COOLANT SYSTEM is being performed. Which one of the following correctly completes the statement below to describe the action taken to minimize the likelihood of a radioactive release to the environment in the event that a subsequent Steam Generator Tube Rupture were to occur with the elevated RCS activity.

The Reactor is shut down and…

a. the MSIVs are closed.

b. S/G blowdown is maximized.

c. the RCS is cooled down below 500 F.

d. CVCS letdown flow is maximized with all demineralizers in service.

96. The following conditions exist on Unit 2:

- An inadvertent SI resulted in a reactor trip
- Transition has been made to 2-EOP-TRIP-3 "Safety Injection Termination"
- Immediately following the reset of SI and Phase A Isolation, off-site power is lost

Which one of the following correctly describes the response of the 4 kV vital buses?

a. Electrical load shed occurs, the EDG output breakers shut, and then the SEC actuates in MODE II Blackout.

b. Electrical load shed occurs, the EDG output breakers shut, and then the SEC actuates in MODE III SI and Blackout.

c. The Emergency Diesel Generators start, the EDG output breakers shut and then the SEC actuates in MODE II Blackout.

d. The Emergency Diesel Generators start, the EDG output breakers shut and then the SEC actuates in MODE III SI and Blackout.

97. Given the following conditions for Unit 2:

- A LOCA has been identified
- 2-EOP-FRTS-1 "Response To Imminent Pressurized Thermal Shock Conditions" has been entered due to a PURPLE path condition
- SI has actuated and is reset
- All RCPs are stopped
- ECCS flow CANNOT be terminated
- Support conditions required to start an RCP have been met
- RCS Subcooling is 0 degrees

Which one of the following correctly describes the basis for not starting an RCP?

An RCP should not be started because:

a. the subsequent pressure surge could aggravate the flaw.

b. the sudden flow change could cause rapid temperature changes.

c. the loss of RCS inventory may be aggravated.

d. natural circulation will slowly remove thermal gradients.

98. Which one of the following correctly describes the reason for waiting for RCS T-hot values to lower below 543 F before continuing with RCS depressurization during the initial cooldown performed in 2-EOP-TRIP-4 "Natural Circulation Cooldown"?

    a. To allow time for Natural Circulation to develop.

    b. Provide for raising Pressurizer level to at least 22% for the establishment of letdown.

    c. Prevent the delta-T between the Pressurizer Spray nozzle and Pressurizer vapor space from exceeding limits.

    d. Ensure a minimum RCS subcooling of 50 F during subsequent depressurization.

99. Which of the following correctly describes the post-accident condition that can lead to high containment pressure and subsequent containment failure early in the progression of an accident?

    a. Hydrogen gas buildup and ignition.

    b. Loss of all CFCUs.

    c. Loss of one Containment Spray Subsystem and 2 CFCUs.

    d. RCPs are not tripped at 1350 psig.

100. Which of the choices below correctly completes the following statement?

    If radiation level inside containment is determined to be 1E8 R/hr during an accident:

    a. Control Room instrumentation will no longer be reliable.

    b. Adverse containment values for key parameters must be used for the remainder of the accident until permission to return to normal values is granted by the TSC.

    c. Adverse containment values for key parameters must be used until radiation levels lower below the adverse monitoring threshold.

    d. Only environmentally qualified instrumentation may be used because it is not susceptible to radiation damage.

Reactor Operator Answer Key

1.	b or a	26.	b
2.	a	27.	d
3.	a	28.	c
4.	c	29.	d
5.	b	30.	a
6.	b	31.	a
7.	d	32.	c
8.	d	33.	c
9.	a	34.	d
10.	b	35.	b
11.	a	36.	c
12.	b	37.	b
13.	c	38.	d
14.	c	39.	a
15.	b	40.	c
16.	b	41.	b
17.	d	42.	d
18.	a	43.	b
19.	c	44.	a
20.	d	45.	d
21.	d	46.	d
22.	a	47.	b
23.	b	48.	c
24.	c	49.	b
25.	d	50.	a

51. c	76. d
52. c	77. b
53. a	78. c
54. d	79. a
55. c	80. b
56. b	81. d
57. a	82. c
58. b	83. c
59. a	84. b
60. d or c	85. a
61. d	86. d
62. b	87. c
63. b or d	88. a
64. d	89. b
65. d	90. b
66. ~~a~~ b	91. a
67. c	92. d
~~68. b~~ delete	93. a or d
69. a	94. b
70. b	95. c
71. a	96. a
72. c	97. c
73. d	98. d
74. b	99. a
75. d	100. b

Attachment 4

SALEM SRO WRITTEN EXAM W/ANSWER KEY

U.S. Nuclear Regulatory Commission
Site-Specific
Written Examination

Applicant Information	
Name:	Region: I / II / III / IV
Date:	Facility/Unit: Salem
License Level: RO / SRO	Reactor Type: W / CE / BW / GE
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. The passing grade requires a final grade of at least 80.00 percent. Examination papers will be collected ~~four~~ five hours after the examination starts.

Applicant Certification

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

____
Applicant's Signature

Results	
Examination Value	100 Points
Applicant's Score	________ Points
Applicant's Grade	________ Percent

1. A motor operated valve (MOV) SJ12, Boron Injection Tank Outlet Isolation Valve has been manually seated. In accordance with NC.NA-AP.ZZ-0005, Station Operating Practices, which one of the following correctly identifies the specific information required to be printed on the White Caution Tag that is installed on the breaker of that MOV?

    a. The date and time the LCO for the Inoperable MOV expires.

    b. The Technical Specification LCOs in effect due to the Inoperable MOV.

    c. Direction for the MOV to be unseated by hand prior to the circuit breaker being closed.

    d. Direction for the MOV to be electrically cycled as part of the return to Operability Requirements.

2. Given the following conditions:

    - Unit 1 is performing a startup on Day Shift
    - The crew is preparing to synchronize the main generator to the grid
    - The PO reports to the Control Room Supervisor (CRS) that the 0730 Technical Specification log readings are not completed
    - Current time is 1030

    In accordance with SC.OP-AP.ZZ-0110. Use and Development of Operating Logs, which one of the following correctly identifies the required actions?

    The Log readings...

    a. shall be completed and reviewed before 1130.

    b. shall be completed and reviewed before 1330.

    c. have been missed. Make an entry in the narrative log that readings have been missed.

    d. have been missed. Make an entry in the narrative log that readings have been missed and refer to Technical Specifications for any required actions.

3. The Unit 1 on-shift RO has noticed an obviously incorrect value logged on the previous shift's Control Room logs.

   In accordance with SH.OP-DD.ZZ-0004, Operations Standards, which one of the following correctly describes all of the actions you shall take to correct the log reading?

   a. The incorrect value shall be circled in red and the correct value, with an explanation, placed in the comments section.

   b. The incorrect value shall be circled in red and the correct value logged . These changes will be initialed and dated by the original operator when next on shift.

   c. A single line shall be drawn through the incorrect value, the correct value logged and the change dated and initialed. The correct value should then be circled in red with an explanation placed in the comments section.

   d. A single line shall be drawn through the incorrect value, the correct value logged and the change dated and initialed. The log cannot be submitted until the reading is also initialed by the original log taker.

4. Which one of the choices below correctly completes the following statement concerning control of plant power changes?

   For Mode 1 power changes ...

   a. neither the CRS nor OS is required to be notified in advance of a normal dilution for Axial Flux Difference (AFD) control.

   b. the CRS does NOT need to be informed prior to reducing load in response to a Feedwater problem.

   c. the STA must be present at the controls for a power change of greater than 5%.

   d. the STA must verify all boration and dilution calculations prior to the evolution.

5. Excessive stroking of motor operated valves (MOV's) during surveillance testing has been identified as a reason for premature failure of motor actuators.

   Which one of the following correctly identifies the procedural limit for full strokes on a MOV during surveillance testing in accordance with S1.OP-ST.SJ-0003, Inservice Testing Safety Injection Valves Modes 1-6?

   a. 2 per hour

   b. 3 per hour

   c. 4 per hour

   d. 5 per hour

6. Given the following conditions:

   - A Red Blocking Tag (RBT) is hung on a 480 VAC breaker
   - This breaker is tagged in the OPEN position
   - The bus associated with this breaker is energized

   Which one of the following correctly completes the description of the required tagging actions if this breaker is required to be removed from its cubicle for maintenance?

   The RBT shall...

   a. remain on the breaker. An additional RBT is installed on the Foreign Material Exclusion device placed in the cubicle opening.

   b. remain on the breaker. A White Caution Tag is installed on the safety rope/tape placed across the cubicle opening.

   c. be removed from the breaker but kept active and maintained in the physical possession of the Supervisor responsible for the job while the breaker is out of the cubicle.

   d. be removed from the breaker. The same RBT is installed on the Foreign Material Exclusion device placed in the cubicle opening.

7. Unit 1 is operating at 100% power. During a scan of control board indications, the RO observed the "VCT LEVEL HI-LO" & "VCT LEVEL LO MAKEUP NOT IN AUTO" console alarms illuminated and determined makeup controls were not restored to AUTO following a recent dilution. Makeup controls were placed in AUTO, VCT level restored and the console alarms cleared. No other audible or visual alarms were received. A check of annunciators indicates the CC2 Group alarm function is not working.

   In accordance with SC.OP-AP.ZZ-0108, Removal/Return of Nuclear Safety Equipment, which one of the following correctly identifies the actions you shall take for these conditions?

   a. Make a One Hour Report for a Loss of Annunciators.

   b. Initiate a Priority 3 AR to address the failure of the CC2 Group Console Alarm.

   c. Initiate a Priority "A" Action Request to address the failure of the CC2 Group Console Alarm.

   d. Begin a controlled shutdown due to loss of annunciators.

8. Given the following conditions with Unit 1 operating at 100% power:

   - 11 Safety Injection (SI) Pump is out of service for repairs to 1SW169, SW Isolation to 11 SI Pump. Repairs are expected to be completed within the next 24 hours.
   - A routine QA Audit of completed surveillance procedures has determined the quarterly surveillance performed on 12 SI Pump (Per S1.OP-ST.SJ-0002) 35 days ago was not properly completed.

   In accordance with Technical Specifications, which one of the following actions is correct for this situation?

   a. Enter T.S. 3.0.3 but the required actions can be delayed for 24 hours in accordance with T.S. 4.0.3.

   b. Per T.S. 4.0.3, re-perform the surveillance on 12 SI Pump within 24 hours or enter T.S. 3.0.3

   c. Enter T.S. 3.0.3. The 25% allowance of T.S. 4.0.2 has been exceeded.

   d. Enter T.S. 3.0.3 until the LCO applicable to the SI Pumps is met.

9. Given the following conditions:

   - Both Units are operating at 100% power
   - Reactor Engineering has determined that a single fuel assembly in the spent fuel pool needs to be moved to a new storage location and has initiated an Action Request for this movement
   - This assembly has been in the pool (out of the reactor vessel) for 100 months
   - The Operations Superintendent has given permission for this movement
   - Radiation Protection has been notified of the movement

   Which one of the following correctly completes the statement concerning the operations requirements for this evolution?

   A Senior Reactor Operator...

   a. shall be on the crane trolley during any fuel movement.

   b. shall be in the Fuel Handling Building during any fuel movement.

   c. is not required if SFP boron concentration is verified to be >2000 ppm.

   d. is not required for this evolution.

10. In 1999, an Equipment Operator received 450 mrem while visiting a foreign nuclear plant as part of a Technical Exchange Program. The Operator's prior exposure at Salem was 175 mrem for the current year.

    If no exposure limit extensions have been authorized, which one of the following correctly lists the MAXIMUM additional non-emergency Total Effective Dose Equivalent (TEDE) that this individual could receive at Salem for the remainder of 1999?

    a. 1375 mrem

    b. 1825 mrem

    c. 3375 mrem

    d. 3825 mrem

11. During implementation of the Emergency Plan, the Extended Yearly Dose Limit (TEDE) for a fully qualified Radiation Worker with documented lifetime dose is set at 4500 mrem.

    Which of the following choices below correctly describes the process that accomplishes this extension?

    The extension to 4500 mrem is....

    a. made upon the authorization of the Radiological Assessment Coordinator (RAC) for an Alert or higher.

    b. made upon the authorization of the of the Emergency Duty Officer (EDO) for a Site Area Emergency or higher.

    c. made automatically upon declaration of an Alert or higher.

    d. made automatically only upon declaration of a General Emergency.

12. Given the following conditions:

    - An independent verification is required on two valves in an area with a 75 mr/hour dose rate

    Which of the following correctly identifies the maximum time allowed for the independent verification before the requirement for the "hands-on" verification may be waived?

    a. 5 minutes

    b. 8 minutes

    c. 10 minutes

    d. 12 minutes

13. Unit 2 is operating at 100% power with all systems in automatic. Intermediate Range (IR) Channel N35 failed several days ago and has been properly removed from service.

    Which one of the following correctly identifies an expected crew response if a Reactor Trip were to occur?

    a. The Reactor Trip can be confirmed with one IR Channel.

    b. The Reactor Trip cannot be confirmed with only one IR Channel.

    c. The Reactor Trip can be confirmed after the crew manually energizes the Source Range detectors.

    d. The Reactor Trip cannot be confirmed since Source Range detectors will not energize until jumpers are installed.

14. While directing Unit 2 operation in accordance with an Abnormal Procedure (AB), the Control Room Supervisor (CRS) reaches a step that reads: "SEND an operator to secure turbine gland sealing steam".

    Which one of the following correctly completes the description of the actions the CRS shall take?

    The CRS may progress to the next step in the AB...

    a. if that next step is prefaced with: "IF AT ANY TIME".

    b. at any time, since ABs allow step performance in non-sequential order.

    c. after the Nuclear Equipment Operator has completed the step and has reported back to the Control Room.

    d. after the Nuclear Equipment Operator has been directed to perform the step and has acknowledged the order.

15. Given the following conditions on Unit 1:

- A trip has occurred from 100% power
- The Control Room Supervisor (CRS) is directing the actions of EOP-TRIP-1, "Reactor Trip Or Safety Injection"
- The Shift Technical Advisor is monitoring the Continuous Action Summaries
- The RCPs are tripped in accordance with the CAS

Which one of the following correctly describes how the trip of the RCPs is captured as a permanent record?

a. After the event, the Unit 2 CRS shall update the narrative log from data recorded on the EOP Flow Charts.

b. The PO shall log the event in the Narrative log.

c. The CRS shall log the event directly on the EOP Flow Charts.

d. The STA shall log all major plant manipulations during EOP usage.

16. Given the following conditions for Unit 1:

- Reactor trip from 100% power due to steamline break and RCS leak.
- All RCPs have been tripped.
- SI and Steamline Isolation have actuated.

The STA notes the following:

- Intermediate Range NIs – 10E-03 Amps, -0.3 dpm
- RCS Tcold temperatures – 460 degrees F, lowering slowly
- RVLIS Full Range – 95% and lowering
- All SG NR Levels – Off-scale Low
- Aux Feedwater Flow - 23E04lbm/hr to TWO S/Gs
- Containment Pressure - 11 psig, rising
- Pressurizer Level - Off-scale Low

Which one of the following correctly identifies the monitoring frequency required for the Critical Safety Function Status Trees?

a. Continuous.

b. Every 5 minutes.

c. Every 15 minutes.

d. Every 30 minutes.

17. Plant conditions are such that a deviation from a Technical Specification LCO is "foreseen and required".

    In accordance with NC.NA-AP.ZZ-0005, Station Operating Practices, which one of the following correctly describes the actions required for this entry?

    Invoking 10CFR50.54(x) will:

    a. require immediate commencement of a unit shutdown.

    b. require notifying the NRC in advance, if possible.

    c. be accompanied by declaring an Alert.

    d. require a notification of the NRC within 15 minutes .

18. A SG feed pump trip occurred resulting in a turbine runback on Unit 2. Power was reduced from 100% steady-state conditions using a combination of rods and boration. The following conditions exist for Unit 2 following stabilization:

    - Reactor Power - 60%
    - Delta-I target value - -2.0%
    - Actual Delta-I - -10.5%
    - Control Bank D position - 160 steps withdrawn
    - Tavg - 562 F

    Which one of the following correctly describes actions that will maintain the current power level and maintain Delta-I within its normal operating band over the next FIVE hours?

    a. Boration and control rod insertion for AFD, followed by dilution for xenon compensation.

    b. Dilution and control rod insertion for AFD, followed by boration for xenon compensation.

    c. Boration and control rod withdrawal for AFD, followed by dilution for xenon compensation.

    d. Dilution and control rod withdrawal for AFD, followed by boration for xenon compensation.

19. Given the following:

- Reactor power at 90%
- Power Range N-41 failed HIGH fifteen (15) minutes ago
- Control rods are in MANUAL control
- An operator bypassed the rod stop, but did not defeat the N-41 input to the power mismatch circuit
- Tavg is greater than Tref by one (1) degree F

Which one of the following correctly describes the response of the rod control system if the Rod Selector Switch is placed in AUTOMATIC?

a. Rods will not move.

b. Rods will step in a few steps and stop.

c. Rods will step in at 8 steps per minute.

d. Rods will step in at 72 steps per minute.

20. An Estimated Critical Position (ECP) calculation was performed and boron concentration was adjusted for a critical rod height of Control Bank D at 58 steps. However, personnel performing the ECP incorrectly used the BOL HFP Curves instead of the BOL HZP curves when determining control bank rod worth.

Which one of the following correctly describes the effect this error would have on critical rod height?

a. Rod position at criticality would be lower than the ± 300 pcm administrative limit.

b. Rod position at criticality would be lower than calculated but above the ± 300 pcm administrative limit.

c. Rod position at criticality would be higher than calculated but less than the ± 300 pcm administrative limit.

d. Rod positioin at criticality would be higher than the ± 300 pcm administrative limit.

21. A loss of coolant accident has occurred. The RVLIS Summary Display Page is displaying dynamic range. During a cooldown and depressurization, void content indication remains constant at 80%.

Which one of the following correctly describes actual void content response during this cooldown and depressurization?

Actual void content:

a. increased due to change in density as pressure and temperature decreased.

b. decreased due to change in density as pressure and temperature decreased.

c. remained constant; differential pressure alone is an accurate indication of void content.

d. remained constant; indicated void content is compensated using pressure and temperature signals.

22. The following conditions exist:

- Unit 1 is in Mode 4
- RCS temperature is 280 degrees F as indicated by In-core Thermocouples
- Pressurizer level indicates 30%
- RCS pressure is 350 psig
- 11 Residual Heat Removal (RHR) Pump is operating and all RCPs are OFF
- Loops 11 and 12 cold leg temperatures are 285 degrees F
- Steam Generator secondary temperatures are 330 degrees F

Which one of the following correctly describes the anticipated RCS pressure response and the reason for that response if the 12 RCP is started?

a. Rises due to heating the RCS fluid as it passes through the Steam Generators.

b. Lowers due to higher temperature loop water being cooled as it passes through the core region.

c. Lowers because Pressurizer spray is initiated via bypass flow.

d. Rises because letdown flow will be reduced.

23. Unit 1 is in Mode 5, with the following conditions:

    - RCS pressure is 120 psig
    - Seal inlet temperatures, and #1 seal leakoff temperatures are approaching their alarm setpoints
    - 11-14 CV104, #1 seal leakoff valves are open, but leakoff flowrates range from 0.4-0.8 gpm
    - Total seal injection flow is 22 gpm

    Which one of the following correctly describes a condition that must exist before the combined #1 seal leakoff bypass valve, 1CV114, may be opened per S1.OP-SO.RC-0001(Q), "Reactor Coolant Pump Operation"?

    a. Seal leakoff flow must be raised to > 1 gpm for each pump.

    b. RCS pressure must be reduced below 100 psig.

    c. Seal injection flow must be greater than 6 gpm to each RCP.

    d. CCW must be available to all RCP Thermal Barrier Hxs.

24. Unit 2 is at 100% power with all systems in normal alignment and 21 Charging Pump in service. Due to a failure of the Master Flow Controller, the charging flow control valve, 2CV55 has gone to the minimum flow position.

    Which one of the following correctly describes the flow into the RCS?

    a. All pump flow will be through the mini flow valves CV139 and CV140.

    b. All flow will be to the charging header.

    c. All flow will be to the RCP seals.

    d. Reduced flow to the charging header and RCP seals.

25. The following plant conditions exist:

- Reactor power: 70%
- Rod control: AUTOMATIC
- Letdown flow: 40 GPM

2CC71, LETDOWN HEAT EXCHANGER TEMPERATURE CONTROL VALVE, fails to the full closed position due to a temperature sensor failing low.

Which one of the following correctly describes the plant response to this event?

a. VCT temperature rises causing a reduction in charging pump NPSH.

b. Letdown flow increases due to decreasing backpressure.

c. RCS boron concentration will slowly rise with the CVCS demineralizers bypassed.

d. Pressurizer level will rise and VCT level will lower when CV7 closes.

26. Given the following conditions on Unit 2:

- Reactor power - 50%
- 21 RHR Pump tagout in progress
- Maintenance has requested that 21RH19, RHR Train Cross-connect Valve, and 21SJ49, Cold Leg Injection Isolation Valve be tagged out to facilitate work

In accordance with Technical Specifications, which one of the following correctly completes the description of the required response for this request?

The tagout...

a. can be approved as long as 22RH19 is open.

b. can be approved and covered under the umbrella of the TSAS for the RHR Pump.

c. shall NOT be allowed since this would require stationing operators at manual RH12, RHR HX Bypass Valves.

d. shall NOT be allowed because an entry into Tech Spec 3.0.3 would be required.

27. Which one of the following correctly describes an AUTOMATIC action that occurs when RWST level is <15 ft after a large break LOCA on Unit 2?

    a. RHR to SI suction valves (SJ45) OPEN.

    b. SI pump miniflow valve (SJ67, SJ68) CLOSE.

    c. SI to Charging Pump Crossover Valves (SJ113s) OPEN.

    d. RWST to Charging Pump suction valves (SJ1, SJ2) CLOSE.

28. During a Unit 1 cooldown per S1.OP-IO.ZZ-0006, PS1 malfunctioned. The following temperatures and pressures were observed during a review of P250 trends:

Time	T cold	RCS pressure
0940	510 F	1700 psig
1000	500 F	1750 psig
1020	490 F	1850 psig
1040	483 F	1950 psig
1100	475 F	1850 psig
1120	470 F	1785 psig

Assume NO operator action occurred between 0940-1120 and all appropriate actions were taken per S1.OP-IO.ZZ-0006 prior to 0940.

In accordance with S1.OP-IO.ZZ-0006, which one of the following correctly describes the appropriate operator action if the current trends continue?

a. Continue cooldown, no problem exists.

b. Continue cooldown, but reduce cooldown rate.

c. Stop the cooldown. Depressurize to 1500 psig to comply with pressure-temperature limits.

d. Stop the cooldown and depressurization and block the low pressure SI.

29. Given the following conditions on Unit 2:

- RCS Tavg - 305 F and stable
- PRT parameters
  - Pressure - 3.5 psig
  - Level - 70%
  - Temperature - 98 F

One hour later when PRT PRESS HI (CC2) alarmed, the operator noted the following PRT parameters:

- Pressure - 10.2 psig
- Level - 81%
- Temperature - 126 F

Which one of the following correctly describes the conditions that resulted in the change in parameters?

a. PRT to Vent Header Isol Valve 2PR15 failed closed.

b. CVCS Letdown Relief Valve 2CV6 lifted.

c. NT25, Nitrogen to the PRT was opened.

d. PRT Water Supply Isolation Valve 2WR82 opened while filling RCP standpipes.

30. Which one of the following correctly describes the operation of the 2CC131, RCP Thermal Barrier Discharge Flow Control Valve?

The valve will close on Phase B Isolation...

a. and high flow if in AUTO.

b. and high flow if in AUTO or MANUAL.

c. if in AUTO, but will close on high flow if in AUTO or MANUAL.

d. if in AUTO or MANUAL, but will close on high flow only if in AUTO.

31. The following plant conditions exist:

- Steady state operation at 100% power
- The PZR Pressure Master Controller is in AUTO with I&C testing in progress
- Assume Pressurizer pressure control remains in automatic

Which one of the following correctly describes the IMMEDIATE automatic response of the system if a Technician error results in a step change in the Master Pressure Controller setpoint to 2360 psig?

a. Power operated relief valves PR1 and PR2 open and spray valves close.

b. Power operated relief valve PR1 opens and spray valves open.

c. Spray valves close and Pressurizer heaters energize.

d. Spray valves open and Pressurizer heaters de-energize.

32. The following plant conditions exist:

- Unit 1 is at 100% power
- Pressurizer Level Channel 1 is selected for control
- Pressurizer Level Channel 2 is selected for alarm
- Pressurizer Level Channel 2 fails LOW

Which one of the following correctly completes the description of the immediate plant response assuming no operator intervention?

Charging flow...

a. does NOT change, letdown isolates, and ALL Pressurizer Heaters shut off.

b. will rise to maximum, letdown isolates, and ONLY Backup Pressurizer Heaters shut off.

c. will rise to maximum, letdown isolation does NOT occur, and ALL Pressurizer Heaters shut off.

d. does NOT change, letdown isolation does NOT occur, and ONLY Backup Pressurizer Heaters shut off.

33. Given the following plant conditions:

    - Unit 1 is at 100% power
    - Containment pressure Channel I indication becomes erratic
    - The channel is removed from service in accordance with S1.OP-SO.RPS-0005.

    Which one of the following correctly describes plant response if Containment Pressure Channel IV subsequently fails high?

    a. No response other than channel related alarms.

    b. An AUTO SI actuation on 2/3 channel tripped.

    c. AUTO SI, Containment Spray, Main Steamline Isolation and Phase B Isolation all actuate.

    d. Main Steamline Isolation and Phase B Isolation. Containment Spray valves reposition but the Containment spray pumps do not start.

34. RCS pressure has decreased to 1859 psig during a plant cooldown. Appropriate actions have been taken as required by S2.OP-IO.ZZ-0005, Minimum Load to Hot Standby. Subsequently, a large steamline break occurs downstream of the MSIVs.

    Which one of the following correctly describes the ESF response to this break?

    a. No SI or Main Steamline Isolation will occur.

    b. BOTH a Main Steamline Isolation and an SI will occur.

    c. A Main Steamline Isolation will occur, but an SI will NOT occur.

    d. An SI will occur, but a Main Steamline Isolation will NOT occur.

35. Unit 2 was operating at 100% power when an automatic Safety Injection occurred due to a high steamline flow coincident with LO-LO Tave. The following conditions now exist:

- The leak has been isolated
- All SI signals have been cleared
- Reactor Trip Breaker A failed to open and remains closed
- An I&C Technician has completed installing the P-4 jumper for Reactor Trip Breaker A in accordance with the respective I&C procedure
- All SI and RHR Pumps are stopped
- 21 CVC Pump is running and the BIT is isolated in accordance with EOP-TRIP-3, SI Termination

Which one of the following correctly describes Safety System response if a Pressurizer safety valve fails open and RCS pressure lowers below the automatic SI setpoint?

a. SI automatically initiates only from Train A.

b. SI automatically initiates only from Train B.

c. SI automatically initiates from both Train A & B.

d. MANUAL SI must be initiated or equipment must be started/aligned individually.

36. Intermediate Range (IR) compensating voltage fails LOW on one of the IR detectors. The reactor subsequently trips due to other causes, but the IR current on the failed detector does NOT go below 5.0 E-5 amps.

Which one of the following items correctly describes how the source range instruments will be energized as reactor power decreases below 7.0 E-11 amps?

a. P-6 will be unblocked and the source range detectors will automatically reenergize.

b. The failed IR detector will be bypassed allowing the source range detectors to energize.

c. The source range manual reset pushbuttons will be used to manually reenergize the source range detectors.

d. One source range detector will automatically reenergize and the other will be manually re-energized using the reset pushbuttons.

37. The plant is shutdown in Mode 5 with RCS temperature at 100 degrees F. RCS pressure control is in a normal lineup for the current RCS pressure and temperature.

The following control board indications are noted:

- POPS INITIATED PRESSURE HI Bezel Alarm for Channel I
- CHANNEL I PRESSURE HI Bezel Alarm for Channel I
- PR1 NOT FULL CLSD OHA E-6
- PR1 indicates open

Which one of the following correctly identifies the transmitter that will give the above indications when it fails HIGH?

a. PT403

b. PT405

c. PT456

d. PT474

38. Given the following:

- Both Units are at 100% power
- All systems are normally aligned
- A loss of off-site power occurs

Which one of the following correctly completes the description of the response of the Containment Fan Cooling Units (CFCUs)?

The CFCUs are tripped and...

a. must be manually restarted.

b. one CFCU is started on each bus in high speed.

c. then sequenced onto the safety-related electrical buses in the slow speed mode.

d. then sequenced onto the safety-related electrical buses in normal high speed mode.

39. Which one of the following describes the flowpath through the Containment Fan Coil Units during a LOCA?

    a. Low speed flow through demister, then HEPA filter, then charcoal filter, then cooling coils.

    b. Low speed flow through demister, then roughing filter, then HEPA filter, then cooling coils.

    c. Low speed flow through demister, then HEPA filter, then cooling coils.

    d. Low speed flow through roughing filter, then demister, then cooling coils, then HEPA filter.

40. Which one of the following correctly describes the protection specifically designed to prevent a spurious actuation of Containment Spray (CS) as a result of a loss of power or a voltage fluctuation?

    a. A normally OFF key switch is provided in the CS pump start circuitry.

    b. The CS bistables energize to trip on Hi-Hi Containment Pressure.

    c. The CS bistables are powered from 125 VDC battery buses.

    d. An SI signal must be present for CS to actuate.

41. Containment Purge operations are in progress during MODE 5 operations. The following conditions are noted:

    - 1R41D was determined to be inoperable prior to the start of the purge operation
    - 1R12A is being continuously monitored

    Which one of the following correctly describes conditions that will require immediate MANUAL termination of the purge operation in accordance with the Containment Purge to Plant Vent procedure, S1.OP-SO.WG-0006?

    a. A downscale failure of 1R12A.

    b. A downscale failure of 1R11A.

    c. 1R12B becomes inoperable.

    d. 1R11A becomes inoperable during the purge operation.

42. Unit 1 Spent Fuel Cooling System requires cross-connecting to Unit 2 Spent Fuel Cooling System to support maintenance activities.

    Which of the following statements correctly describes the flowpaths associated with this evolution?

    a. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling Pumps and Heat Exchanger.

    b. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling Pumps using Unit 1 Spent Fuel Cooling Heat Exchanger.

    c. Unit 2 Spent Fuel Cooling System provides limited cooling to both Unit 1 & Unit 2 Spent Fuel Pits.

    d. Unit 1 Spent Fuel Pit is cooled by Unit 2 Spent Fuel Cooling System Heat Exchanger using Unit 1 Spent Fuel Cooling Pumps.

43. The Unit 2 Advanced Digital Feedwater Control System (ADFWCS) average steam pressure calculation output has failed.

    Which one of the following correctly describes the expected response of the Feedwater Control System?

    a. Only 21-24BF19 valves will switch to manual control mode.

    b. Only SGFP controllers will switch to manual control mode.

    c. Only 21-24BF19 and BF40 valves will switch to manual control mode.

    d. The 21-24BF19s, BF40s and both feed pump controllers will switch to manual control mode.

44. The following plant conditions exist:

    - Plant is operating at 55 percent power with all systems normally aligned
    - One main steam code safety valve fails full open
    - The plant continues to operate

    Which one of the following correctly describes the approximate power level the plant will stabilize at if the valve remains OPEN and no operator action is taken?

    a. 57.5 percent.

    b. 60.5 percent.

    c. 65 percent.

    d. 75 percent.

45. Given the following conditions on Unit 2:

- Reactor power was 65% when the turbine tripped and an ATWS occurred
- The reactor tripped 20 seconds later when Train A reactor trip breaker was locally opened
- Train B reactor trip breaker is failed closed
- No controls other than control rods and boration controls have been operated

Which one of the following correctly describes the operation of the steam dumps for these conditions?

Steam Dumps will…

a. open immediately following the turbine trip and modulate to stabilize Tavg at its no-load value.

b. open when the trip breaker is opened and modulate to stabilize Tavg at its no-load value.

c. open immediately following the turbine trip and modulate to stabilize Tavg 5 degrees above its no-load value.

d. open when the trip breaker is opened and will be blocked closed when Tavg falls below its low-low value.

46. Unit 2 is at 50% power. 21 SGFP is manually tripped. 22 SGFP subsequently trips on a loss of Lube oil.

Which one of the following correctly describes the status of the Aux Feedwater Pumps?

a. The motor driven AFW Pumps immediately start when the 22 SGFP trips.

b. The motor driven AFW Pumps will not start until S/G levels drop below 9%.

c. All AFW pumps auto start only if the jumpers were installed in the 21 SGFP trip circuit.

d. All AFW Pumps immediately start when the 22 SGFP trips.

47. The following is a list of conditions that will result in SGFP trips.

Which condition will trip both SGFPs simultaneously?

a. Condenser vacuum decays to 20" Hg.

b. Main Turbine trip with power at 83%.

c. Containment pressure rises to 4.4psig.

d. Inadvertent actuation of the Feedwater Interlock.

48. The reactor is at full power. Auxiliary Feedwater pump 23 LOCAL/REMOTE switch has been inadvertently left in LOCAL at the Hot Shutdown Panel.

    Which one of the following correctly describes the consequences of this error?

    The 23 AFW Pump will start...

    a. if both SGFPs trip.

    b. when actuated by an AMSAC signal.

    c. on a loss of 125VDC control power.

    d. if the START pushbutton in the control room is operated.

49. Given the following conditions:

    - Unit 1 is in MODE 3
    - Unit 2 reactor power - 18%
    - The Main Generator is synchronized to the grid
    - Steam Dumps are closed.
    - 21A, 22A and 23A Circulators have tripped.

    Which one of the following correctly identifies the failure which would cause the simultaneous trip of these Circulators?

    a. An undervoltage condition lasting 0.2 seconds on 2CW Bus Section 23.

    b. 3 SPT Differential Overcurrent.

    c. Breaker failure on 500 kV BS 9-10 (30X) breaker.

    d. Phase to Ground fault on the Salem 2CW 4KV bus Section 23.

50. Which one of the following correctly describes the normal flowpath for power to the 115 Vital Instrument Bus D on Unit 2?

    a. DC power from the 2B 125 VDC Bus rectified to 120 VAC.

    b. AC power from 2C 230 VAC Vital Bus transformed to 120 VAC.

    c. AC power from the 2B 230 VAC Vital Bus, rectified to 140 VDC inverted to 120 VAC.

    d. AC power from 2C 230 VAC, stepped down to 140 VAC to the AC Line Regulator and reduced to 120 VAC.

51. A loss of off-site power has occurred, the emergency diesel generators are running and loaded. The 2A1 Battery Charger output breaker has tripped open.

Assuming no operator action, which one of the following correctly identifies the battery capacity of Class 1E 125 VDC buses during these conditions?

a. All batteries will carry all DC loads until completely discharged, which is estimated to be approximately TWO hours.

b. All batteries will be supplied by the chargers from the 230 VAC buses indefinitely, 2A battery automatically shifted to the 2A2 Battery Charger.

c. The 2A battery will provide adequate power to loads for approximately TWO hours. The other batteries will be supplied by the chargers from the 230 VAC buses indefinitely.

d. The 2A battery will provide adequate power to loads for approximately TWO hours. The other batteries will discharge at a rate of 2320 amps for approximately FOUR hours until depleted.

52. 125 VDC breaker 2BDC1AX12, 2G 4KV Bus Control Power Supply (Reg) tripped due to a breaker malfunction.

Which one of the following correctly describes the impact this malfunction will have?

a. 24 RCP will trip immediately.

b. 24 RCP will remain running but will not trip if required.

c. Emergency control power from the 2A 125 VDC bus will automatically be provided.

d. 24 RCP breaker will trip if required but will not close to start the pump.

53. Given the following conditions on Unit 2:

- Reactor power - 100%
- 2A Emergency Diesel Generator (EDG) was being run to maintain engine oil temperature due to failure of the prelube pump during Preventive Maintenance
- The breaker feeding the jacket water heater on the 2A EDG tripped and CANNOT be re-closed
- Electrical Maintenance determines breaker and circuit wiring will need to be replaced
- Repairs are expected to take 30 hours

In accordance with Technical Specifications, which one of the following correctly describes the required actions?

a. 2B and 2C EDG must be tested independently within the next 24 hours.

b. 2B or 2C EDG must be tested within the next 24 hours.

c. Periodically run 2A EDG to maintain Lube oil temperature.

d. 2B and 2C EDG must be verified operable but neither EDG need be run within the next 24 hours.

54. A steamline break inside containment and loss of off-site power have occurred on Unit 1. All D/Gs are running loaded in SEC Mode 3. All required equipment started and the crew has implemented 1-EOP-TRIP-1, Reactor Trip or Safety Injection. The SECs have not been reset. OHA alarm J-20, 1C DG URGENT TRBL and console bezel alarm 1C TROUBLE have actuated. The NEO dispatched to investigate reports the local annunciator panel alarm is HIGH LUBE OIL TEMPERATURE and Lube oil temperature is 208 degrees F.

Which one of the following is the correct response for this situation?

a. Direct an NCO to block 1C SEC on the RP-1 Panel to avoid losing 1C 4KV Vital Bus when 1C SEC is reset in the EOPs.

b. Direct the NEO to investigate and attempt to correct the problem. 1C 4KV Vital Bus will be lost if the SEC is reset with this problem standing.

c. Direct the NEO to push the local EMERGENCY TRIP pushbutton. 1C EDG should have tripped automatically.

d. Direct the NEO to trip 1C EDG at the fuel rack. The local EMERGENCY TRIP is not functional on a SEC start.

55. Which one of the following correctly completes the description of the condition that ensures release limits are NOT exceeded when discharging the contents of a WGDT?

The Radioactive Gaseous Waste Release Valve (WG41)...

a. will close when pressure exceeds 2.9 psig upstream of WG41.

b. will close when pressure exceeds 5.3 psig downstream of WG41.

c. must be throttled by the operator to limit the discharge flowrate to 32 scfm during the release.

d. is designed to limit the discharge flowrate to 32 scfm when the valve is full open.

56. Which one of the following correctly describes the response of the GB4's (S/G Blowdown Outlet Isolation Valves) to a rising radiation condition on only Unit 1 or Unit 2 R19D, Steam Generator Blowdown Liquid Monitor, for 14 or 24 SG?

a. On Unit 1, only 14GB4 will close on a warning condition.
On Unit 2, all GB4 valves will close on an alarm condition.

b. On Unit 1, all GB4 valves will close on an alarm condition.
On Unit 2, only 24GB4 will close on an alarm condition.

c. On Unit 1, only 14GB4 will close on a warning condition.
On Unit 2, all GB4 valves will close on a warning condition.

d. On Unit 1, all GB4 valves will close on a warning condition.
On Unit 2, only 24GB4 will close on an alarm condition.

57. RP-1 OH Annunciator, MN STM MON R46A-D FAIL was received. Investigation reveals:

- LOW COOLANT FLOW and VALVE SHUT-OFF indicating lights on Panel 158 have illuminated for Steam Line Radiation Monitors (2R46).
- It is noted that 2R46A lost coolant flow to the shield.

Which one of the following correctly describes the condition that will allow steam to be admitted to the remaining shields that are verified to have sufficient coolant flow?

a. With any 2R46 low coolant flow alarm present, steam flow cannot be initiated to any shield.

b. When the 2R46A low coolant flow alarm is acknowledged, steam flow is automatically restored to the unaffected shields.

c. The OVERRIDE key switch for each shield having proper cooling flow is utilized to open the respective solenoid valve.

d. The solenoid valves for the unaffected channels open when the OVERRIDE key switch for 2R46A is operated to bypass that loss of cooling flow signal.

58. Unit 2 is at the end of life with the following conditions:

- A plant startup is in progress
- Reactor power - 8%
- RCS boron concentration 100 ppm
- Control Bank D is at 138 steps
- Circuit failure at the RAISE RODS pushbutton results in outward rod motion

Which one of the following correctly identifies the condition that will terminate the power increase if NO operator action is taken?

a. Power Range High Flux HI setpoint trip.

b. Power Range High Flux LO setpoint trip.

c. C-11, Control Bank D Fully Withdrawn Rod Stop.

d. C-1, Intermediate Range High Flux Rod Withdrawal Stop.

59. Given the following conditions on Unit 2:

- A reactor startup is in progress
- All Shutdown Bank rods are fully withdrawn
- Control Banks A, B are fully withdrawn
- Control Bank C is being withdrawn at 210 steps
- Control Bank C rod H-14 dropped due to a fuse failure

Which one of the following correctly completes the statement about the status of the ROD BANK URGENT FAIL alarm (OHA E-40)?

The alarm actuates...

a. after the fuse failed and rod motion was commanded.

b. only when the rod is being recovered.

c. only after H-14 clears 20 steps during recovery operations.

d. as soon as the rod was misaligned from the bank by at least 12 steps.

60. Unit 2 was at 95% power with a power ascension in progress when PT-505 failed high causing control rods to be withdrawn at 72 steps per minute. When rods were placed in manual, the following conditions existed :

- Reactor power is 95%
- Current Group Counter positions for Control Bank D
  - Group 1 - 200 steps
  - Group 2 - 199 steps
- Current rod positions indications (IRPI and Plant Computer)
  - 1D1 - 180 steps
  - 1D2 - 199 steps
  - 1D3 - 200 steps
  - 1D4 - 200 steps
  - 2D1 - 186 steps
  - 2D2 - 199 steps
  - 2D3 - 199 steps
  - 2D4 - 200 steps
  - 2D5 - 200 steps
- All rods were determined to be trippable.

In accordance with Technical Specifications, which one of the following correctly describes the action required to be taken?

a. Enter and take the actions of Tech Spec 3.0.3.

b. Reduce reactor power to less than 85% within 1 hour.

c. Reduce power to less than 50% within 1 hour.

d. No action is required until a 1 hour soak is completed.

61. Unit 2 is operating at 50% power when PR1 fails open.

Assuming no operator action, which one of the following correctly describes the plant response to this condition?

a. Reactor Trip and Safety Injection on low pressure.

b. Reactor Trip on OPDT and Safety Injection on low pressure.

c. Pressurizer level will rise causing a Reactor Trip on high Pressurizer level and Safety Injection on low pressure.

d. Safety Injection and Reactor Trip on High Containment Pressure

62. Operators are performing the actions of 2-EOP-LOCA-2 "POST LOCA COOLDOWN AND DEPRESSURIZATION". A Pressurizer PORV is opened to de-pressurize the RCS to fill the Pressurizer. No RCPs are operating.

Which one of the following correctly describes the basis for stopping the depressurization when Pressurizer level is above 33%?

a. Prevents isolation of CVCS letdown when a RCP is started.

b. Ensures RCS subcooling is maintained when SI flow reduction is initiated.

c. Maintains Pressurizer level above the SI reinitiation criteria when a RCP is started.

d. Provides adequate Pressurizer level to maintain Pressurizer heaters operable as RCS voids collapse.

63. The following conditions exist on Unit 2:

- A LOCA has occurred
- SI has been reset
- Pressurizer pressure - 2000 psig
- Pressurizer level - 25%
- SPDS CET temperature - 576 F
- Adverse containment conditions do NOT exist

The actions of 2-EOP-TRIP-1 and 2-EOP-LOCA-1 have been completed and the crew is performing actions of 2-EOP-LOCA-2.

In accordance with 2-EOP-LOCA-2, which one of the following correctly identifies the conditions that would require the operator to manually start ECCS pumps and realign SI?

a. RCP seal injection flow remains below 24 gpm total.

b. A steam generator atmospheric relief valve fails open reducing RCS temperature to 530 F.

c. A Pressurizer PORV fails open causing RCS pressure to decrease to 1200 psig prior to PORV isolation.

d. Establishing normal charging following SI reduction results in Pressurizer level decreasing to 17%.

64. A LOCA has occurred on Unit 2.

Which one of the following correctly identifies the reason RCPs are stopped if containment pressure exceeds 15 psig?

a. RCP motor bearings will be damaged.

b. RCP seal flow cooling is lost.

c. RCP control may be lost since the electrical insulation is NOT qualified.

d. Continued RCP heat input will contribute to containment pressure exceeding design limits.

65. The following conditions exist on Unit 2:

- Reactor power - 100% power for 4 months
- 24 RCP trips resulting in a reactor and turbine trip
- Plant stabilizes with steam dumps controlling at no-load Tavg

Which one of the following correctly completes the description of 24 SG pressure and steam flow parameters as compared with those of the unaffected loops?

24 SG pressure will be...

a. lower and steam flow will be lower.

b. the same and steam flow will be lower.

c. the same and steam flow will the same.

d. higher and steam flow will be the same.

66. Given the following Unit 2 conditions:

    - Reactor power - 100%
    - No dilutions or borations in progress
    - VCT level transmitter, 2LT-114, fails HIGH

    Which one of the following correctly completes the description of what occurs if NO operator action is taken?

    VCT level...

    a. lowers when CV35 diverts to the HUT.

    b. rises until CV35 modulates to HUT and maintains VCT level.

    c. lowers faster than auto makeup capability causing charging suction to shift to the RWST.

    d. lowers with NO auto makeup capability causing charging suction to shift to the RWST.

67. Given the following for Unit 2:

    - The reactor was shutdown 220 hours ago after extended power operation
    - RCS Tavg - 155 F
    - Pressurizer level - 20%
    - RHR flow was 1600 gpm
    - Time to core boiling is approximately 15 min.
    - The 21 RHR Pump is available for immediate start

    22 RHR Pump was in service for cooldown but has been stopped due to indications of cavitation. S2.OP-AB.RHR-0001, Loss of RHR has been entered.

    In accordance with S2.OP-AB.RHR-0001, Loss of RHR, which one of the following correctly describes the action(s) required for this situation?

    a. A normal restoration and venting of the entire RHR System.

    b. Start any RHR pump and cycle the RH18s to rapidly change flow and sweep voids away.

    c. 21 or 22 RHR pump shall be started at full flow to sweep voids away.

    d. The 21 RHR Pump shall be started with suction from the RWST for adequate NPSH.

68. Which one of the following correctly identifies the leak location that would result in the fastest rate of level rise in the CCW Surge Tank? (Assume the size of the leak is equal at 0.25 square inches for each component.)

    a. 21 RHR Heat Exchanger with RHR providing shutdown cooling.

    b. 21 CCW Heat Exchanger aligned for cooling, at power.

    c. No. 2 Spent Fuel Pit Heat Exchanger when in service, at power.

    d. No. 2 Excess Letdown Heat Exchanger when in service, at power.

69. Following a cooldown caused by a Steam Dump malfunction, Pressurizer level fell below 17% and was rapidly restored by increasing charging flow. Pressurizer pressure also fell to 2185 psig.

    Which one of the following correctly identifies the reason why the pressure recovery from 2185 psig takes a longer time for this event, than it does if a PORV fails open and the PORV block valve was closed at 2185 psig?

    a. The volume of steam generation and cooling is greater with the level change.

    b. Subcooled water insurge during refill reduced the Pressurizer liquid space temperature.

    c. When the PORV opens, only the steam space needs to be reheated to raise pressure.

    d. The heaters are less effective since they had tripped off and cooled off on low PZR level.

70. Given the following conditions for Unit 2:

- 21 Charging Pump is in service
- Reactor power - 100%
- CVCS parameters:
  - Letdown flow (FI-134) - 75 gpm
  - Charging flow (FI-128B1) - 87 gpm
  - Total seal injection flow (FI-115, 116, 143, 144) - 33 gpm
- Controlling Pressurizer level channel LT-459 fails low

Assuming NO operator action is taken, which one of the following correctly completes the description of the effect of the Pressurizer Level Channel failure on total seal injection flow?

Total seal injection flow will...

a. be off-scale high on CC2 indication.

b. decrease to about 20 gpm.

c. remain at 33 gpm.

d. increase to no more than 40 gpm.

71. An ATWS has occurred on Unit 2 and actions are being taken in accordance with 2-EOP-FRSM-1 "Response to Nuclear Power Generation." The operator initiated rapid boration flow by starting both Boric Acid Pumps, opening 2CV175 Rapid Borate Stop Valve, and closing 21 and 22CV160 BAT Recirc valves.

The following conditions exist:

- Reactor power - 3% ; SUR just negative
- RCS temperature (Tavg) - 550 F
- Pressurizer pressure - 2340 psig & rising slowly
- Pressurizer level - 29% & lowering slowly
- Control rods being inserted in MANUAL; Control Bank D is fully inserted
- Turbine is tripped
- Charging flow (FI128B) - 52 gpm
- Boration flow (FI113A) - 35 gpm

In accordance with 2-EOP-FRSM-1, Response to Nuclear Power Generation, which one of the following correctly describes the action the operator shall take to increase the boration rate?

a. Manually actuate Safety Injection.

b. Locally open 2CV-174, Manual Boration Valve.

c. Close 2CV40 and 2CV41, the VCT Discharge Stop Valves.

d. Open a Pressurizer PORV and its associated PORV Stop Valve.

72. Which one of the following correctly identifies the parameters that must be satisfied in order to transition from 2-EOP-FRSM-1 "Response To Nuclear Power Generation"?

a. The Cold Shutdown SDM value is achieved.

b. No more than two control rods failed to insert.

c. Either reactor trip breaker or the associated trip bypass breaker is open.

d. Three Power Range NIS channels less than 5% and Intermediate Range SUR negative.

73. Given the following conditions on Unit 2:

- A Unit Startup is in progress
- Reactor power has been raised to 8%
- Intermediate channel N-35 fails high
- Plant conditions remain stable at current power level

In accordance with NC.NA-AP.ZZ-0005, Station Operating Practices, which one of the following correctly describes required operator actions?

a. Manually trip the reactor.

b. Reduce power to <5% within 15minutes.

c. Maintain power below P10.

d. Raise power to greater than P10 setpoint and block both intermediate ranges.

74. During Unit 1 core off-load, a fuel bundle is dropped during the transit from the core to the upender. Only the bundle that was dropped is damaged.

Which one of the following correctly describes the potential radiation hazard, if any, associated with this event?

a. None. All Iodine will be removed by absorption into the Refueling Cavity water.

b. Minimal to personnel inside containment. A small % of Iodine will enter containment and will be removed by starting the Iodine Removal Units (IRUs).

c. An off-site release will occur through any open containment penetrations and will exceed 10CFR100 limits.

d. None. The IRUs are required to be operating during refueling operations and will remove all Iodine released from the bundle.

75. Given the following conditions on Unit 2:

- Primary to secondary leak has been diagnosed in the 21 S/G
- Operators are performing actions of S2.OP-AB.SG-0001(Q) "STEAM GENERATOR TUBE LEAK"
- Unit cooldown from Hot Shutdown conditions has been commenced
- 21 SG has been isolated

Which one of the following correctly identifies the radiation monitor that would be used to continue trending of the primary to secondary leak rate?

a. Main Steam Line Monitor 2R46A.

b. Main Steam Line Process (N-16) Monitor 2R53A.

c. Steam Generator Blowdown Liquid Monitor 2R19A.

d. Condenser Air Removal and Priming System Process Monitor 2R15.

76. While attempting to identify a ruptured S/G in accordance with 2-EOP-SGTR-1, Steam Generator Tube Rupture, the Reactor Operator notes that RCS pressure has dropped to 1330 psig, even with maximum ECCS flow.

Which one of the following correctly states why the operator is required to trip the RCPs under these conditions?

a. Minimize heat transfer to the ruptured S/G.

b. Ensure against possible misdiagnosis, operator error, or multiple events.

c. Ensure natural circulation is established prior to pressure equalization steps.

d. Minimize the likelihood of RCS voiding impeding heat transfer to the intact S/Gs.

77. Given the following conditions on Unit 2:

- A Steam Generator Tube Rupture has occurred
- Operators are performing 2-EOP-SGTR-1 "STEAM GENERATOR TUBE RUPTURE"
- Condenser steam dumps were used to cooldown to the required cooldown temperature
- RCS depressurization with Pressurizer spray valves is about to start
- The RO reports Pressurizer level is now indicating 0%
- Pressurizer pressure is 1230 psig
- RCS Subcooling is 20 F
- High Head charging flow and SI flow have been verified

In accordance with 2-EOP-SGTR-1, STEAM GENERATOR TUBE RUPTURE, which one of the following correctly describes the actions to be taken for the conditions stated above?

a. Maintain RCPs running. Continue depressurization using normal sprays.

b. Trip all RCPs. Depressurize the RCS using a PORV.

c. Trip all RCPs. Maintain stable RCS pressure.

d. Stop all RCPs except the 21 RCP, if available. Use this RCP to continue depressurization with normal sprays.

78. The following conditions were observed while Unit 2 was operating at 100% power:

- Pressurizer level lowering rapidly at 42%
- Pressurizer pressure lowering rapidly at 2100 psig
- All S/G pressures lowering at 682 psig
- 2R11A indication is normal and not changing
- Containment pressure is 2 psig and rising
- Reactor power is 103%

Choose the statement below that correctly describes these conditions:

These conditions are caused by:

a. a LOCA inside containment.

b. a S/G safety valve opening.

c. a Steam Line Break downstream of 21MS167.

d. a Steam Line Break upstream of the Main Steam Line flow element.

79. A rapid loss of condenser vacuum has occurred due to a leak in the condenser.

    Which one of the following correctly identifies the first automatic function to occur as vacuum degrades?

    a. Steam Generator Feed Pump trip.

    b. Circulating Water Pump start permissive is lost.

    c. Main Turbine Trip.

    d. LP Turbine rupture disks break.

80. An electrical disturbance resulted in a loss of all Unit 2 Circulators and a reactor trip from 50% power. Significant decay heat causes RCS temperature to increase following the trip.

    Which one of the following correctly identifies the temperature at which the RCS Tavg stabilizes 10 minutes after the trip?

    a. 555 F, the value of the lowest set Main Steam Safety Valve.

    b. 552 F, per the Steam Dump Load Rejection Controller.

    c. 548 F, per the MS10, Main Steam Atmospheric Relief setpoint at 1015 psig.

    d. 543 F, per the Steam Dump Plant Trip Controller.

81. Given the following conditions on Unit 2:

- A break has occurred on the Feedwater line to the 23 SG inside containment
- SI is actuated
- The following parameters are noted:
  - Pressurizer pressure - 1920 psig
  - Lowest Tavg - 544 F
  - Lowest S/G pressure - 980 psig (23)
  - Containment pressure 4.2 psig

Assuming no operator action has been taken, which one of the following correctly describes the expected S/G conditions?

a. Only the 23 S/G pressure would be decreasing from the break.

b. All S/G pressures would be decreasing from the break via interconnection of the Main Steam lines.

c. All S/G pressures would be decreasing from the break via interconnection of the Main Feedwater lines.

d. All S/G pressures would be decreasing from the break via interconnection of the Auxiliary Feedwater lines.

82. Which one of the following correctly completes the operator action concerning Safety Injection actuation in the event of an extended loss of all AC power?

The SI signal will be manually actuated...

a. and reset while the 4KV Vital buses are de-energized.

b. and reset after power is restored to at least ONE 4KV Vital bus.

c. only if automatic actuation is present and is reset while the 4KV Vital buses are de-energized.

d. only if an automatic actuation signal is present and is reset after power is restored to at least ONE 4KV Vital bus.

83. The following conditions exist on Unit 1:

- 1A 4KV Vital Bus is powered from 13 SPT
- 1B & 1C 4KV Vital Bus is powered from 14 SPT
- 1B Emergency D/G surveillance is being performed with the D/G paralleled to the bus and loaded to 2600 kW

An overcurrent condition results in the loss of the 14 Station Power Transformer.

Which one of the following correctly describes the final electrical alignment?

a. All busses are stripped and aligned to their respective D/G in accordance with Mode II SEC Loading.

b. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus swaps to the 13 SPT with the 1B D/G paralleled to the bus.
1C 4KV Vital Bus swaps to the 13 SPT.

c. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus swaps to the 13 SPT with the 1B D/G running and its output breaker open.
1C 4KV Vital Bus swaps to the 13 SPT.

d. 1A 4KV Vital Bus remains powered from 13 SPT.
1B 4KV Vital Bus is powered from the 1B D/G only.
1C 4KV Vital Bus swaps to the 13 SPT.

84. Power for the 2A Vital Instrument Bus transferred from the 2A Vital Instrument Inverter to AC Line Regulator due to a momentary overload on the Inverter.

Which one of the following correctly identifies when the 2A Vital Instrument Bus will revert to the Inverter?

a. Following rotation of the Static Switch to the INV position.

b. When the Return Mode toggle switch is placed in MAN.

c. Automatically as Inverter voltage rises.

d. When the ALARM CONTACT RESET pushbutton is depressed.

85. During the performance of 2-EOP-LOPA-1, Loss of All AC Power, the operating crew is directed to implement AB.LOOP-0001, Loss of Off-Site Power, Attachment 1, Blackout Coping Actions. An operator is sent to place both Unit 3 engines in LOCKOUT and open the 125 VDC distribution panel main breaker.

Which one of the following correctly describes the reasons for these actions?

a. Unload the Unit 3 battery while the switchyard is prepared for the Unit 3 startup.

b. Prepare the Unit 3 battery charger to feed into the station 125 VDC System.

c. Reduce heat loads in the Jet Control House until power can be restored.

d. Prevent Auto start of Unit 3 until the switchyard is prepared.

86. Given the following:

- All Unit 1 & 2 Circulating Pumps are in service
- Unit 1 is in Mode 3
- Unit 2 is at 100% power
- 21,23 & 26 Service Water Pumps are running
- 21 CVCS Monitor Tank is being released via 21 CCW Hx to the Circulating Water System

In accordance with S2.OP-SO.WL-0001, RELEASE OF RADIOACTIVE LIQUID WASTE FROM 21 CVCS MONITOR TANK, which one following correctly identifies the condition that would require termination of the liquid release?

a. The 21A & 21B Circulators trip.

b. The 11A & 11 B Circulators trip.

c. 21 CCW Pump trips.

d. 23 Service Water Pump trips and Service Water header pressure drops from 115 to 105 psig.

87. Unit 2 is operating at 100% power when a tube leak occurs in the 21 CCW HX.

Which one of the following correctly describes the consequence of this event?

a. RCPs may need to be tripped due to a reduction in CCW header pressure.

b. The Aux Building Exhaust System filters and in service Waste Holdup Tanks may become contaminated with chromates.

c. Chromates will be transported to the Delaware river by the Service Water System.

d. Components cooled by CCW will experience a reduction in cooling that could cause a plant shutdown.

88. A fire occurs in Unit 2 Turbine Building with all Fire Systems in a normal lineup. While en route to the scene, a fire truck crashed into # 1 FW Storage Tank, rupturing the tank.

Which one of the following correctly describes the status of the alternate sources to the Salem Fire Water header?

The Salem Fire Water Header will be supplied by:

a. #2 Diesel Fire Pump with suction from the #2 FW Storage Tank even if #1 FW Tank. No operator action is required.

b. #1 Diesel Fire Pump with suction from #2 FW Tank provided an operator opens the normally closed suction valve.

c. Hope Creek Fire Pumps via a normally open cross-tie. No operator action is required.

d. Hope Creek Fire Pumps provided an operator opens the normally closed cross-tie valve.

89. The operators are initiating seal injection to the RCPs in accordance with S2.OP-AB.CR-0002 "CONTROL ROOM EVACUATION DUE TO FIRE IN CONTROL ROOM, RELAY ROOM, OR CEILING OF THE 460/230V SWITCHGEAR ROOM".

Which one of the following correctly describes a requirement for establishing seal injection?

a. Control Air is available for control of 2CV55.

b. 125 Volt Vital DC is available for operation of the centrifugal charging pump breakers.

c. 230 volt AC power is available for operation of 2CV68 or 2CV69.

d. CCW is available for the thermal barrier heat exchangers.

90. Which one of the following correctly describes the reason for starting a RCP when performing 2-EOP-FRCC-1"Response to Inadequate Core Cooling"?

a. Facilitate rapid RCS depressurization using a normal Pressurizer Spray valve.

b. Improve heat transfer until additional makeup flow to the RCS can be established.

c. Allow the use of RVLIS dynamic head range for a better indication of RCS level.

d. Minimize the inventory loss by using two-phase heat transfer when rapidly de-pressurizing the S/Gs.

91. S2.OP-AB.RC-0002, HIGH ACTIVITY IN REACTOR COOLANT SYSTEM is being performed. Which one of the following correctly completes the statement below to describe the action taken to minimize the likelihood of a radioactive release to the environment in the event that a subsequent Steam Generator Tube Rupture were to occur with the elevated RCS activity.

The Reactor is shut down and...

a. the MSIVs are closed.

b. S/G blowdown is maximized.

c. the RCS is cooled down below 500 F.

d. CVCS letdown flow is maximized with all demineralizers in service.

92. The following conditions exist on Unit 2:

- An inadvertent SI resulted in a reactor trip
- Transition has been made to 2-EOP-TRIP-3 "Safety Injection Termination"
- Immediately following the reset of SI and Phase A Isolation, off-site power is lost

Which one of the following correctly describes the response of the 4 kV vital buses?

a. Electrical load shed occurs, the EDG output breakers shut, and then the SEC actuates in MODE II Blackout.

b. Electrical load shed occurs, the EDG output breakers shut, and then the SEC actuates in MODE III SI and Blackout.

c. The Emergency Diesel Generators start, the EDG output breakers shut and then the SEC actuates in MODE II Blackout.

d. The Emergency Diesel Generators start, the EDG output breakers shut and then the SEC actuates in MODE III SI and Blackout.

93. A LOCA has occurred on Unit 2 and all equipment has operated as designed. Actions are being taken in accordance with EOP-LOCA-2. The following stable plant conditions are observed after stopping ONE Charging Pump:

- Pressurizer pressure - 830 psig
- Pressurizer level - 28%
- RCS temperature (CETs) - 480 °F
- Containment pressure has risen to 3.4 psig
- Containment Radiation levels have risen to 1000 R/hr

In accordance with EOP-LOCA-2, which one of the following correctly describes the action that should be taken for these conditions?

a. SI should be manually re-initiated.

b. The Charging pump should be restarted based on subcooling value.

c. Stopping of ONE SI pump should be evaluated using the normal values for subcooling and Pressurizer level.

d. Stopping of ONE SI Pump should be evaluated using the Adverse Containment values for subcooling and Pressurizer level.

94. The following conditions exist on Unit 2:

- A small break LOCA has occurred outside containment.
- Actions of 2-EOP-LOCA-6 "LOCA Outside Containment" have failed to isolate the break.
- At the completion of 2-EOP-LOCA-6, RCS pressure is continuing to drop.

Which one of the following correctly identifies the procedural transition from 2-EOP-LOCA-6 "LOCA Outside Containment"?

a. 2-EOP-TRIP-7 "Re-diagnosis" in an attempt to diagnose the break location.

b. 2-EOP-LOCA-1 "Loss of Reactor Coolant" to resume actions to address the LOCA.

c. 2-EOP-TRIP-1 "Reactor Trip or Safety Injection" in order to re-verify that all automatic actions have been completed.

d. 2-EOP-LOCA-5 "Loss of Emergency Coolant Recirculation" in order to deal with the loss of available inventory for core cooling.

95. A Unit 2 Reactor Trip occurred after a 200 day continuous run at 100% power. Following the trip, all AFW flow was lost and the Crew transitioned to FRHS-1. Due to distractions caused by a pressure channel failure, bleed and feed steps were not initiated until WR S/G levels were all <10%.

Which one of the following correctly describes the general consequence of the delay?

a. Core uncovery will not occur as long as one PZR PORV is open and one centrifugal charging pump is injecting prior to SG dryout.

b. Core uncovery will not occur as long as both PZR PORVs are open and both centrifugal charging pumps are injecting prior to SG dryout.

c. Core uncovery will be more severe because RCS pressure will remain at a higher value for a longer time, limiting ECCS flow.

d. Core uncovery will be more severe only if the PRT rupture disk fails, increasing the loss of mass, while ECCS flow is limited by RCS pressure.

96. Given the following conditions for Unit 2:

- A LOCA has been identified
- 2-EOP-FRTS-1 "Response To Imminent Pressurized Thermal Shock Conditions" has been entered due to a PURPLE path condition
- SI has actuated and is reset
- All RCPs are stopped
- ECCS flow CANNOT be terminated
- Support conditions required to start an RCP have been met
- RCS Subcooling is 0 degrees

Which one of the following correctly describes the basis for not starting an RCP?

An RCP should not be started because:

a. the subsequent pressure surge could aggravate the flaw.

b. the sudden flow change could cause rapid temperature changes.

c. the loss of RCS inventory may be aggravated.

d. natural circulation will slowly remove thermal gradients.

97. Given the following Unit 2 conditions:

- Off-site power is unavailable
- RCS temperature - 540 F
- Pressurizer pressure - 2200 psig
- All RCPs are stopped
- RVLIS is NOT available
- A rapid cooldown, with the potential for vessel upper head void formation, is required.

For these conditions, which one of the following correctly describes the difference in actions between a rapid cooldown when RVLIS is NOT available as compared to a rapid cooldown when RVLIS is available?

The maximum cooldown rate is...

a. 100 F/hr with RVLIS and 50 F/hr without RVLIS.

b. 100 F/hr with or without RVLIS.

c. 100 F/hr with or without RVLIS only for the initial cooldown to 500 F, and then is 100 F/hr with RVLIS and 50 F/hr without RVLIS for subsequent cooldown steps.

d. 100 F/hr with RVLIS and 50 F/hr without RVLIS only for the initial cooldown to 500 F, and then is 100 F/hr with or without RVLIS for subsequent cooldown steps.

98. Given the following conditions on Unit 2:

- A LOCA has occurred
- 2-EOP-LOCA-5 "LOSS OF EMERGENCY RECIRCULATION" is the procedure in effect
- A PURPLE path exists for Containment Environment due to high pressure

Which one of the following correctly describes the reasons for the operator's actions associated with the Containment Spray System?

The Containment Spray System is operated as directed in...

a. LOCA-5 because it establishes minimum required containment spray flow and conserves RWST inventory.

b. LOCA-5 since FRPs are not implemented during the performance of LOCA-5.

c. 2-EOP-FRCE-1 "RESPONSE TO EXCESSIVE CONTAINMENT PRESSURE" because actions concerning Containment Spray operation are more restrictive.

d. 2-EOP-FRCE-1 "RESPONSE TO EXCESSIVE CONTAINMENT PRESSURE" since restoration of the critical safety function takes precedence.

99. Which of the following correctly describes the post-accident condition that can lead to high containment pressure and subsequent containment failure early in the progression of an accident?

   a. Hydrogen gas buildup and ignition.

   b. Loss of all CFCUs.

   c. Loss of one Containment Spray Subsystem and 2 CFCUs.

   d. RCPs are not tripped at 1350 psig.

100. Which of the choices below correctly completes the following statement?

   If radiation level inside containment is determined to be 1E8 R/hr during an accident:

   a. Control Room instrumentation will no longer be reliable.

   b. Adverse containment values for key parameters must be used for the remainder of the accident until permission to return to normal values is granted by the TSC.

   c. Adverse containment values for key parameters must be used until radiation levels lower below the adverse monitoring threshold.

   d. Only environmentally qualified instrumentation may be used because it is not susceptible to radiation damage.

Senior Reactor Operator Answer Key

1.	c	26.	d
2.	a	27.	c
3.	c	28.	d
4.	b	29.	b
5.	b	30.	d
6.	d	31.	c
7.	c	32.	a
8.	a	33.	a
9.	d	34.	c
10.	a	35.	d
11.	c	36.	c
12.	b	37.	b
13.	a	38.	a
14.	d	39.	c
15.	c	40.	b
16.	a	41.	a
17.	b	42.	d
18.	c	43.	d
19.	a	44.	b
20.	b	45.	c
21.	d	46.	a
22.	a	47.	c
23.	c	48.	c
24.	d	49.	d
25.	a	50.	c

51. c
52. b
53. a
54. b
55. d or c
56. b
57. c
58. d
59. ~~a~~ b
60. d
61. a
62. c
63. c
64. a
65. b
66. a
67. c
68. d
69. b
70. d
71. d
72. d
73. a
74. b
75. c
76. b
77. a
78. d
79. c
80. c
81. b
82. a
83. d
84. c
85. a
86. b
87. b
88. d
89. a or d
90. b
91. c
92. a
93. c
94. d
95. c
96. c
97. d
98. a
99. a
100. b