U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-295/OL-85-02

Docket No. 50-295
Docket No. 50-304

License Nos. DPR-39/48

Licensee: Commonwealth Edison
Zion Generating Station
Zion, IL

Facility Name: Zion, 1 and 2

Examination Administered At: Zion Training Center

Examination Conducted: Five (5) SRO Examinations

Examiners: Ralph R. Ferrell — Date: 7/29/85

R. Higgins — Date: 7/29/85

T. Reidinger — Date: 7/29/85

Approved By: R. Higgins for J. McMillen
Operating Licensing Section — Date: 7/29/85

Examination Summary

Examination administered on June 17-19, 1985 (Report No. 50-295/OL-85-02)
Results: All five (5) SRO candidates passed the written, oral, and simulator portions of the examination.

REPORT DETAILS

1. Examiners

R. Ferrell - Chief Examiner
R. Higgins - Examiner
T. Reidinger - Examiner
P. Doyle - Headquarters Observer

2. Examination Review Meeting

At the conclusion of the written examination, the examiners met with Mark Carnahan, Ray Landrum, Tim Blake and Haral Logaras of the training department. As a result of this review a list of comments was generated and are included, along with the examiners comments, on a separate attachment.

3. Exit Meeting

At the conclusion of the site visit the examiners met with representatives of the plant staff to discuss the results of the examinations. Those individuals who clearly passed the oral and/or simulator were identified in this meeting.

Zion SRO Examination Comments

Attachment 1

Comment 5.01
The answer key has two answers.

Examiner response 5.01
Agreed - will also accept "a" for full credit.

Comment 5.05
Since U-238 contributes 7% of fissions, there is no correct answer.

Examiner response 5.05
Disagree - per the basic nuclear engineering reference manuals consulted, the answer to this question is correct when all answers are considered. The majority of the candidates answered this question correctly.

Comment 5.06
The answer should be B. U-238

Examiner response 5.06
Disagree - per the basic nuclear engineering reference manuals consulted, the answer to this question is correct when all answers are considered. The majority of the candidates answered this question correctly.

Comment 5.17
C is the standard advertised answer. Both C and D are correct.

Examiner response 5.17
Disagree - C is the most correct answer. With a control rod insertion and an excessively negative MTC, overall power will increase due to the decrease in Tave but not just in the top of the core.

Comment 5.22
The question looks like "Explain how we see the effects of the decay heat" when using the word "mechanism" in the question. Correct answer to this may be expected to read like "Fission Fragments in the Fuel Decay by alpha, beta and gamma decay radiation. The fuel and core internals absorb the radiation and heat is generated. Tave increases above 547°F. Stm pressure increases above 1005 and Stm dumps operate to control Tave at 547°F.

Examiner response 5.22
Agree - the above comments were added to the answer key.

Comment 5.23
This is not a simple answer, could be decrease based on Turb efficiency or increase based on Rx efficiency.

Examiner response 5.23
Disagree - The question asked specifically for "unit efficiency" which should have been understood as "overall efficiency." The question was graded by examiner very liberally.

Comment 5.27
Wrong answer to c. It should be, "If pump speed doubles, head quadruples."

Examiner response 5.27
Agreed - The answer key was corrected.

Comment 6.03
Answer F has no question F.

Examiner response 6.03
Agreed - The typo was corrected.

Comment 6.09
Note that the "S" signal only goes to SW0005 and 6 vlvs. Booster pp trip and Fire pp start are subsequent effects.

Examiner response 6.09
Agreed - The candidates answers were graded according to above comment and no credit taken off if subsequent effects not mentioned.

Comment 6.11
Answer to item 1 is not applicable to question.

Examiner response 6.11
Agreed - The additional information was added to key.

Comment 6.17
On section b. We suspect typo in answer. The valve should reclose at 1835 PSIG. If VLV fails open, and it is not due to a single failure, the only way to stop depressurization is to close the block VLV. This should be an additional correct answer.

Examiner response 6.17
Agreed - The answer key was corrected.

Comment 7.05
On section B. the operator would also use EOP-7, App. A, for verification of natural circ, along with the Westinghouse Description. This should be listed as an additional answer.

Examiner response 7.05
Agreed - EOP-7, Appendix A was added as a reference and the question graded accordingly.

Comment 7.11

On Section B., the operator could also close the MSIV's in accordance with the immediate actions listed in EOP-1, Page 4.

Examiner response 7.11

Agreed - The answer key was corrected.

Comment 8.02

Section A. Lists the wrong answer. The pump is NOT operable with the Discharge valve stuck shut.

Examiner response 8.02

Agreed - The typo was corrected.

Comment 8.14

The answer should be no Less than 25 instead of No Greater Than.

Examiner response 8.14

Agreed - The answer key was corrected.

EXAM MASTER

EXAM 0804
1410

Reviewers
HARAL LAGARAS
ROY LANDRUM
TIM BLAKE
MARK CARNAHAM

REVIEW 1420

MASTER COPY

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

FACILITY: ZION 1&2

REACTOR TYPE: PWR-WEC4

DATE ADMINISTERED: 85/06/17

EXAMINER: R.R.FERRELL

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

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

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	25.00			5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
25.00	25.00			6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
25.00	25.00			7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
25.00	25.00			8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
100.00	100.00			TOTALS

FINAL GRADE _____%

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

_____
APPLICANT'S SIGNATURE

QUESTION 5.01 (.50)

Choose the CORRECT response. The installed neutron source currently used at Zion:

A. is needed to initiate the fission process.

B. produces neutrons by the alpha decay of Antimony 123.

C. produces neutrons by the spontaneous fission of Californium 252.

D. is a type of photo-neutron source.

QUESTION 5.02 (.50)

Choose the correct response concerning Samarium:

A. The change in Samarium concentration following a reactor trip will diminish the shutdown margin.

B. Samarium is produced as a result of the beta decay of promethium.

C. The equilibrium Samarium concentration is directly proportional to reactor power.

D. Samarium beta decays to Europium.

QUESTION 5.03 (.50)

Which of the following statements about reactivity is CORRECT?

A. Reactivity is the ratio of the neutrons in the present generation divided by the neutrons in the preceding generation.

B. Reactivity equal to 1 means the reactor is critical.

C. Reactivity can be either added to or removed from the core.

D. Reactivity is the fractional change in neutron population per generation.

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

QUESTION 5.04 (.50)

Choose the CORRECT response. Assume Zion 1 is subcritical with an initial count rate of 25 counts per second. Rods are withdrawn to add 300 PCM of reactivity, resulting in a stable count rate of 40 counts per second. Which of the following is closest to the value of Keff after the rod withdrawl (when the count rate is 40 counts per second)?

A..950
B..990
C..995
D..999

QUESTION 5.05 (.50)

Which of the following nuclides is NOT a fissile nuclide which contributes fissions during power operation at Zion?

A.Uranium 235

B.Uranium 238

C.Plutonium 239

D.Plutonium 241

QUESTION 5.06 (.50)

Choose the CORRECT response. The major contributor to fast fission at Zion is:

A.Uranium 235

B.Uranium 238

C.Plutonium 239

D.Plutonium 241

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

QUESTION 5.07 (.50)

Choose the Correct response. The Importance Factor at Zion is _____ than one because delayed neutrons_____.

A.less; are less likely to leak from the core.

B.less; do not cause fast fission of Uranium 238.

C.greater; are less likely to leak from the core.

D.greater; do not cause fast fission.

QUESTION 5.08 (.50)

Choose the CORRECT response. With a startup rate of .5 decades per minute, reactor power will increase by a factor of 5 approximately every:

A.60 seconds

B.72 seconds

C.84 seconds

D.96 seconds

QUESTION 5.09 (.50)

Choose the CORRECT response. The Isothermal Temperature Coefficient is the sum of the moderator temperature coefficient and the:

A.fuel temperature coefficient when power is below the POAH.

B.power coefficient when power is below the point of adding heat.

C.fuel temperature coefficient when power is above the POAH.

D.power coefficient when power is above the point of adding heat.

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

QUESTION 5.10 (.50)

Choose the CORRECT response. As fuel temperature increases, control rod worth _____; as the relative thermal neutron flux which the control rod experiences increases, control rod worth _____.

A. increases; increases
B. increases; decreases
C. decreases; increases
D. decreases; decreases

QUESTION 5.11 (.50)

Choose the CORRECT response. Assuming a constant flux profile, control rod worth increases as _____ increases.

A. boron concentration

B. total core flux

C. fission product concentration

D. moderator temperature

QUESTION 5.12 (.50)

Choose the CORRECT response. Differential boron worth for a given Tavg (refer to Figure 5-1) is more negative at lower boron concentrations because:

A. of the thermal flux redistribution at lower boron concentrations.
B. fewer boron atoms are available to compete with each other.
C. fewer fuel atoms are present, reducing the thermal utilization coefficient
D. of the harder neutron flux spectrum at lower boron concentrations.

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

QUESTION 5.13 (.50)

Choose the CORRECT response. Differential boron worth for a given boron concentration (refer to Figure 5-1) is more negative at 547 degrees F than it is at 560 degrees F because the:

A. moderator density is less at higher temperatures.
B. boron absorption cross section decreases at higher temperature.
C. neutron spectrum is harder at higher temperature.
D. neutron leakage is greater at high temperature.

QUESTION 5.14 (.50)

Choose the CORRECT response. The procedure for the control of Axial Power Distribution are designed to:

A. minimize the effects of xenon redistribution during load-follow maneuvers.
B. serve as backup protection against a dropped rod or misaligned control rod.
C. ensure adequate control rod reactivity.
D. limit potential reactivity insertions due to a control rod ejection accident.

QUESTION 5.15 (.50)

Choose the CORRECT response. What action is required by Technical Specifications 3.2.2.A.4 if Delta I is -9 when reactor power is 95%. Refer to Figure 5-2.

A. return Delta I to the target band within 1 hour or be in hot shutdown within the next 4 hours.
B. reduce reactor power to less than 50% within 1 hour and reduce the high flux setpoint to less than 55% within the next 4 hours.
C. reduce reactor power 1% for each 1% deviation from the target band within 15 minutes.
D. either the deviation shall be eliminated or the reactor power shall be immediately to a level no greater than 90%.

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

QUESTION 5.16 (.50)

Choose the CORRECT response. What action is required by Technical Specification 3.2.2.A.6 with Delta I at -10 for the last 61 minutes and reactor power at 70%? Refer to Figure 5-2.

A. return Delta I to the target band within 1 hour or be in hot shutdown within the next 4 hours.

B. reactor power shall be reduced to no greater than 50% power and the high flux setpoint reduced to no greater than 55% of rated values.

C. reduce reactor power 1% for each 1% deviation from the programmed band.

D. return Delta I to the target band within 15 minutes or be in hot shutdown within the next hour.

QUESTION 5.17 (.50)

Choose the CORRECT response. In which of the following situations will the further insertion of control rods cause Delta I to become more positive?

A. Buildup of Xenon in the top of the core with rods fully withdrawn.

B. Positive MTC during a reactor startup.

C. Bank D control rods inserted to the core midplane.

D. Excessively negative MTC at EOL.

QUESTION 5.18 (.50)

Choose the CORRECT response. For a Quadrant Power Tilt Ratio (QPTR) of >1.09, Tech Specs section 3.2.2.B.3 requires that the operator:

A. reduce reactor power to less than 50%.
B. reduce reactor power to rated power less 2% for every percent that the QPTR exceeds 1.0.
C. bring the reactror to hot shutdown.
D. reduce reactor power to less than 85%.

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

QUESTION 5.19 (.50)

Choose the CORRECT response. The major source of tritium in the RCS is:

A.diffusion through the clad of tritium produced by ternary fission.

B.reaction of lithium 7 with thermal neutrons.

C.reaction of lithium 7 with fast neutrons.

D.deuterium activation.

QUESTION 5.20 (.50)

Choose the CORRECT response. In order to maintain a 200 F subcooling margin in the RCS when reducing RCS pressure to 1600 psig, steam generator pressure must be reduced to approximately:

A.845 psig
B.645 psig
C.445 psig
D.245 psig

QUESTION 5.21 (.50)

Which of the following conditions is NOT indicative of pump runout?

A.abnormally high discharge pressure

B.excessive current in the pump motor

C.failure of the coupling between the pump shaft and the motor mshaft

D.available NPSH less than the required NPSH

QUESTION 5.22 (1.25)

Decay heat is a significant source of thermal energy in a shutdown reactor. Explain the mechanism of decay heat.

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

QUESTION 5.23 (1.50)

Indicate how the following will affect UNIT efficiency at steady state power level: (Consider the affected parameter only and indicate INCREASE, DECREASE, or NO CHANGE.)

a. Condenser hotwell temperature changes from 125 degrees F to 130 degrees F. [.75]

b. Steam quality changes from 99.8% to 99.7%. [.75]

QUESTION 5.24 (2.25)

Per the Tech Spec bases, the reactor is not to be made critical when the moderator temperature coefficient is positive. Answer the following questions concerning these bases.

A. Why is this requirement imposed?

B. Under what conditions is this requirement waived?

C. Explain when and why the moderator coefficient may be positive. [.75 ea]

QUESTION 5.25 (1.75)

A. Define the term NET POSITIVE SUCTION HEAD as it applies to centrifugal pumps. [1.0]

B. How does the following affect NPSH (INCREASE, DECREASE, or REMAIN THE SAME)?

1. Increase in the tank pressure where the pump is taking suction. [.25]

2. Increase in flow rate of the pump. [.25]

3. Increase in temperature of the fluid being pumped. [.25]

QUESTION 5.26 (1.20)

Using Figures 5-3 thru 5-5, determine the quantity of water required to raise the power from 10% to 50% at BOL with an initial boron concentration of 1000 ~~PPM~~ PPM.

(xxxxx CATEGORY 05 CONTINUED ON NEXT PAGE xxxxx)

QUESTION 5.27 (2.30)

Answer the following concerning general centrifugal pump characteristics:

A. What happens to the system flow rate if a second centrifugal pump in parallel is started with the first one running? [.40]
B. What happens to system flow rate if a second centrifugal pump in series is started with the first one running? [.40]
C. What happens to pump head if you double the pump speed? [.40]
D. What is pump runout? [.50]
E. list 4 indications of pump cavitation. [.6]

QUESTION 5.28 (.50)

Choose the CORRECT response. Assume a critical (Keff=1.000) reactor, power at 20%. If +5 PCM is added by manual withdrawl of rods:

A. Keff will increase, neutron population and core power will continue to increase until the operator inserts -5 PCM by inserting rods or boron.

B. Keff will increase, neutron population and core power will increase by an amount equal to .005%.

C. Keff will increase, neutron population and core power will increase, which will add negative reactivity due to Power Defect (Doppler and MTC), cancelling out the + 5 PCM. The core power will level out by itself at a slightly higher power.

D. Keff will increase, neutron population and core power will increase, which will add negative reactivity due to Power Defect (Doppler and MTC), cancelling out the + 5 PCM. The core power will return to the original power level, at a slightly higher Tave

QUESTION 5.29 (.50)

Choose the CORRECT response(s). During plant operation at the beginning of core life, the RCS boron concentration will be decreased (diluted) by the NSO to:

A. Force the control rods further out.
B. Compensate for an increase in Xenon concentration
C. Compensate for a power reduction
D. Compensate for fuel depletion
E. Compensate for a 5 degree F decrease in Tavg

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

QUESTION 5.30 (1.75)

List 5 ways the NSO at Zion ensures the axial power distribution is within limits at all times?

QUESTION 5.31 (1.50)

As an operator observing the intermediate range nuclear instrumentation following a reactor trip, which would you rather see: undercompensated or overcompensated instruments. Defend your answer.

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

APPENDIX SHEET A

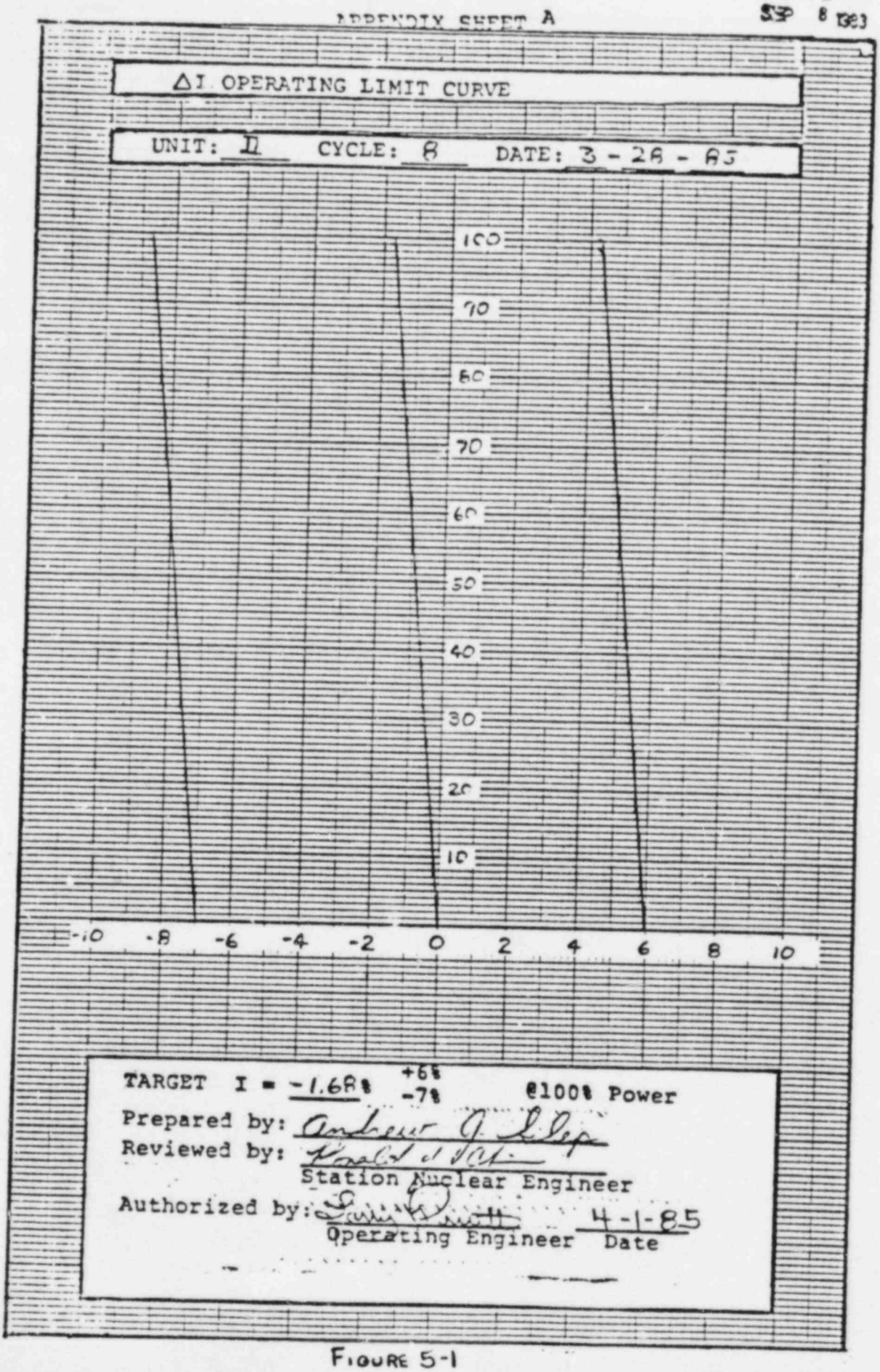

FIGURE 5-1

Figure 1.3 Differential Boron Worth
Versus Moderator Temperature

Ref: (1) WCAP 7675, Fig. 4.1 & 4.4
(2) NFSR-0020, Tables C.10 & C.11

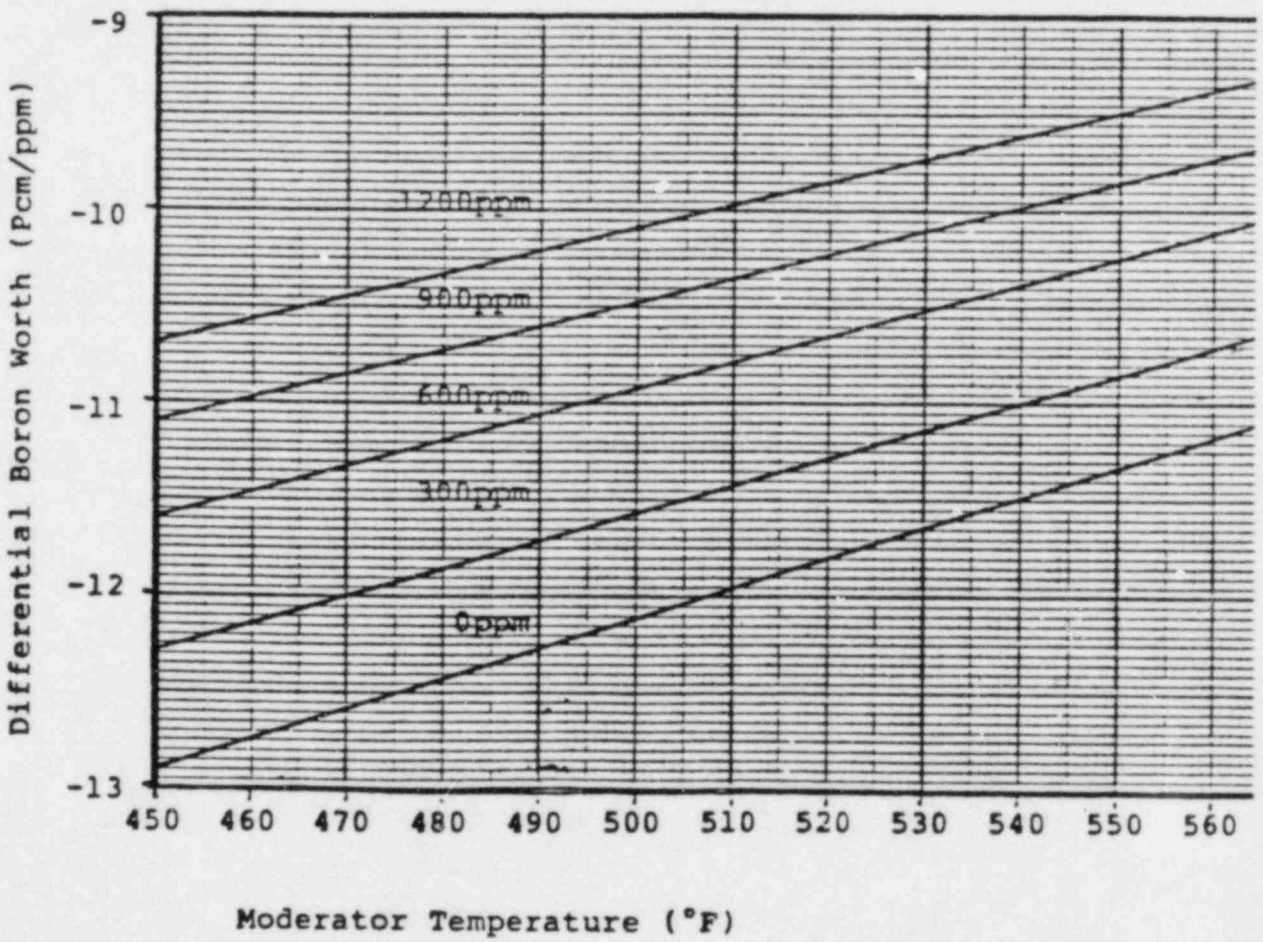

FIGURE F-2

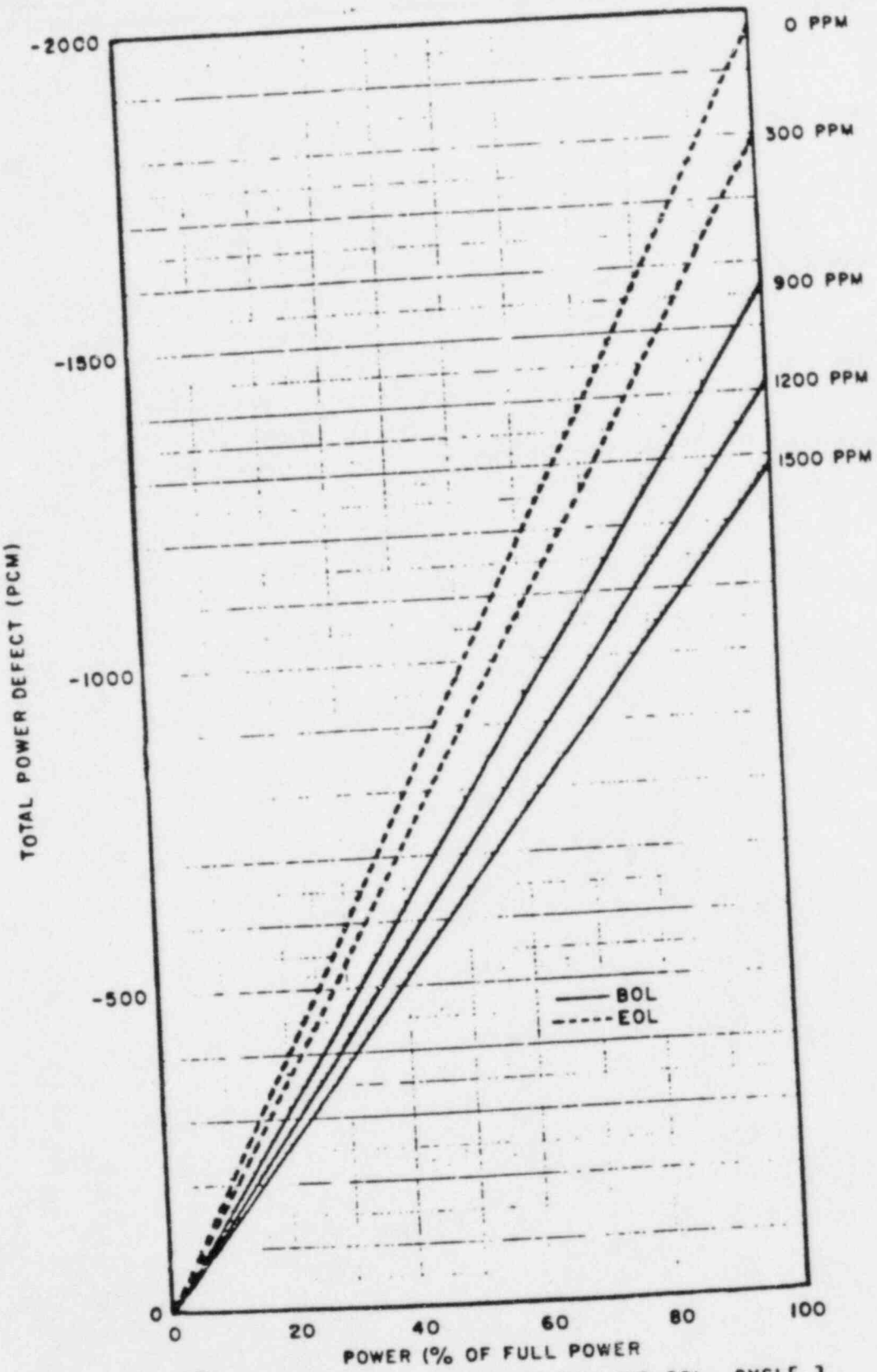

FIGURE 5-3 DEFECT VS. POWER AT BOL AND EOL, CYCLE 1 (REV. 2)

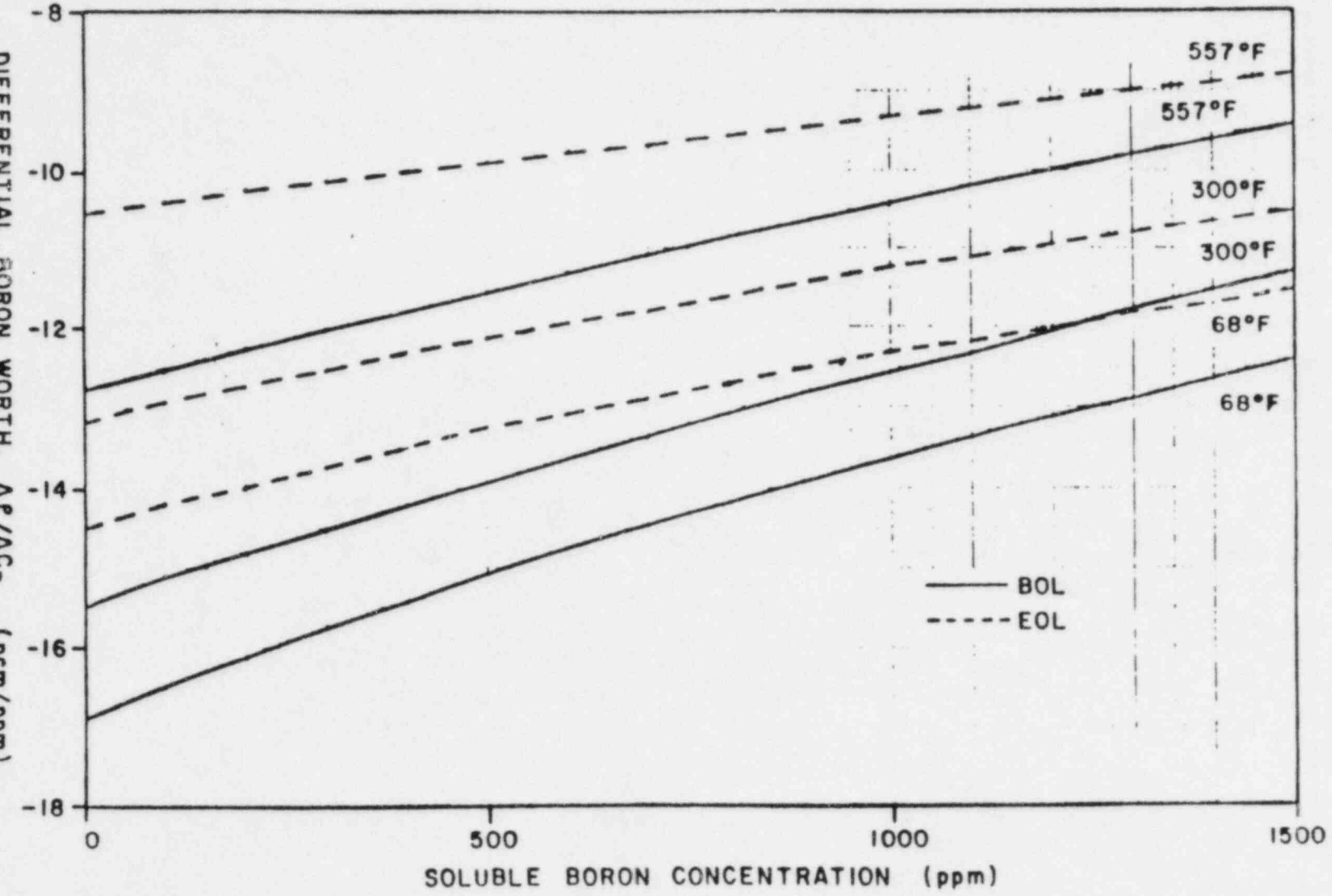

FIGURE 5-4 DIFFERENTIAL BORON WORTH CURVE (BOL, EOL, CYCLE 1) (REV. 2)

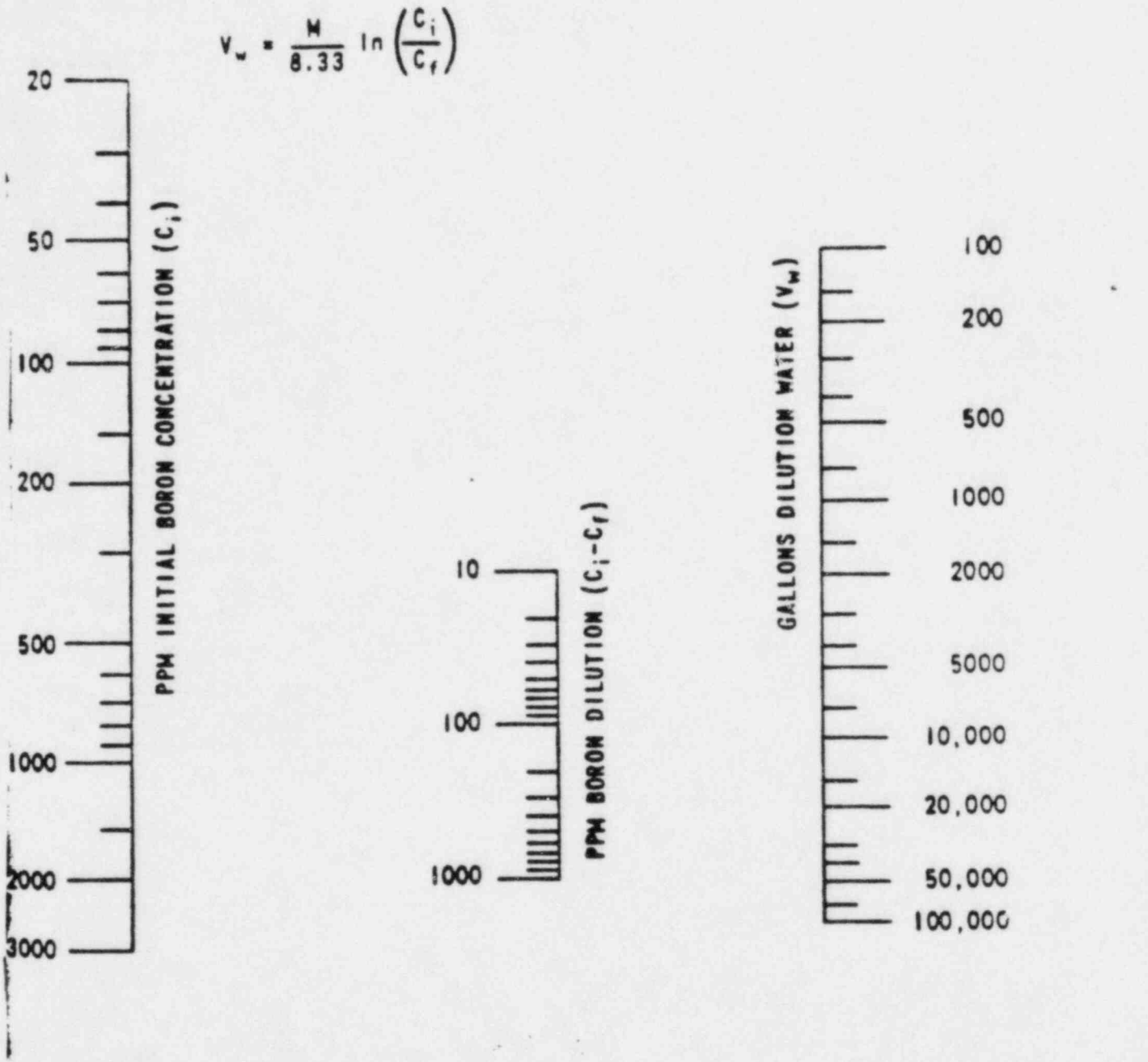

FIGURE 5-5 BORON DILUTION

Table 1. Saturated Steam: Temperature Table—*Continued*

Temp Fahr t	Abs Press Lb per Sq in p	Specific Volume Sat Liquid v_f	Evap v_{fg}	Sat Vapor v_g	Enthalpy Sat Liquid h_f	Evap h_{fg}	Sat Vapor h_g	Entropy Sat Liquid s_f	Evap s_{fg}	Sat Vapor s_g	Temp Fahr t
180.0	7.5110	0.016510	50.21	50.22	148.00	990.7	1138.7	0.2681	1.5480	1.8111	180.0
182.0	7.850	0.016522	48.172	48.189	150.01	989.0	1139.0	0.2852	1.5413	1.8075	182.0
184.0	8.203	0.016534	46.232	46.249	152.01	987.8	1139.8	0.2994	1.5346	1.8040	184.0
186.0	8.568	0.016547	44.383	44.400	154.02	986.5	1140.5	0.2725	1.5279	1.8004	186.0
188.0	8.947	0.016559	42.621	42.638	156.03	985.3	1141.3	0.2756	1.5213	1.7969	188.0
190.0	9.340	0.016572	40.941	40.957	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190.0
192.0	9.747	0.016585	39.337	39.354	160.05	982.8	1142.9	0.2818	1.5082	1.7900	192.0
194.0	10.168	0.016598	37.808	37.824	162.05	981.6	1143.7	0.2848	1.5017	1.7865	194.0
196.0	10.605	0.016611	36.348	36.364	164.06	980.4	1144.4	0.2879	1.4952	1.7831	196.0
198.0	11.058	0.016624	34.954	34.970	166.08	979.1	1145.2	0.2910	1.4888	1.7798	198.0
200.0	11.526	0.016637	33.622	33.639	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200.0
202.0	12.012	0.016664	31.135	31.151	172.11	975.4	1147.5	0.3001	1.4697	1.7698	202.0
204.0	13.568	0.016691	28.867	28.878	176.14	972.8	1149.0	0.3061	1.4571	1.7632	204.0
212.0	14.696	0.016719	26.782	26.799	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212.0
216.0	15.901	0.016747	24.878	24.894	184.20	967.8	1152.0	0.3181	1.4323	1.7505	216.0
220.0	17.186	0.016775	23.131	23.148	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220.0
224.0	18.556	0.016805	21.529	21.545	192.27	962.6	1154.9	0.3300	1.4081	1.7380	224.0
228.0	20.015	0.016834	20.056	20.073	196.31	960.0	1156.3	0.3359	1.3961	1.7320	228.0
232.0	21.567	0.016864	18.701	18.718	200.35	957.4	1157.8	0.3417	1.3842	1.7260	232.0
236.0	23.216	0.016895	17.454	17.471	204.40	954.8	1159.2	0.3476	1.3725	1.7201	236.0
240.0	24.968	0.016926	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240.0
244.0	26.826	0.016958	15.243	15.260	212.50	949.5	1162.0	0.3591	1.3494	1.7085	244.0
248.0	28.796	0.016990	14.264	14.281	216.56	946.8	1163.4	0.3649	1.3379	1.7028	248.0
252.0	30.883	0.017022	13.358	13.375	220.62	944.1	1164.7	0.3706	1.3266	1.6972	252.0
256.0	33.091	0.017055	12.520	12.538	224.69	941.4	1166.1	0.3763	1.3154	1.6917	256.0
260.0	35.427	0.017089	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260.0
264.0	37.894	0.017123	11.025	11.042	232.83	935.9	1168.7	0.3876	1.2933	1.6808	264.0
268.0	40.500	0.017157	10.358	10.375	236.91	933.1	1170.0	0.3932	1.2823	1.6755	268.0
272.0	43.249	0.017193	9.738	9.755	240.99	930.3	1171.3	0.3987	1.2715	1.6702	272.0
276.0	46.147	0.017228	9.162	9.180	245.08	927.5	1172.5	0.4042	1.2607	1.6650	276.0
280.0	49.200	0.017264	8.627	8.644	249.17	924.6	1173.8	0.4096	1.2501	1.6599	280.0
284.0	52.414	0.01730	8.1280	8.1453	253.3	921.7	1175.0	0.4150	1.2395	1.6545	284.0
288.0	55.795	0.01734	7.6634	7.6807	257.4	918.8	1176.2	0.4203	1.2290	1.6493	288.0
292.0	59.350	0.01738	7.2301	7.2475	261.5	915.9	1177.4	0.4256	1.2186	1.6442	292.0
296.0	63.084	0.01741	6.8259	6.8433	265.6	913.0	1178.6	0.4309	1.2082	1.6390	296.0
300.0	67.005	0.01745	6.4483	6.4658	269.7	910.0	1179.7	0.4362	1.1979	1.6341	300.0
304.0	71.119	0.01749	6.0955	6.1130	273.8	907.0	1180.9	0.4414	1.1877	1.6291	304.0
308.0	75.433	0.01753	5.7655	5.7830	278.0	904.0	1182.0	0.4466	1.1776	1.6242	308.0
312.0	79.953	0.01757	5.4566	5.4742	282.1	901.0	1183.1	0.4518	1.1676	1.6193	312.0
316.0	84.688	0.01761	5.1673	5.1849	286.3	897.9	1184.1	0.4569	1.1576	1.6145	316.0
320.0	89.643	0.01766	4.8961	4.9138	290.4	894.8	1185.2	0.4620	1.1477	1.6098	320.0
324.0	94.826	0.01770	4.6418	4.6595	294.6	891.6	1186.2	0.4671	1.1378	1.6050	324.0
328.0	100.245	0.01774	4.4030	4.4208	298.7	888.5	1187.2	0.4721	1.1280	1.6003	328.0
332.0	105.907	0.01779	4.1788	4.1966	302.9	885.3	1188.2	0.4770	1.1183	1.5957	332.0
336.0	111.820	0.01783	3.9681	3.9859	307.1	882.1	1189.1	0.4820	1.1086	1.5911	336.0
340.0	117.992	0.01787	3.7699	3.7878	311.3	878.8	1190.1	0.4869	1.0990	1.5859	340.0
344.0	124.430	0.01792	3.5834	3.6013	315.5	875.5	1191.0	0.4954	1.0894	1.5849	344.0
348.0	131.142	0.01797	3.4078	3.4258	319.7	872.2	1191.1	0.5006	1.0799	1.5806	348.0
352.0	138.138	0.01801	3.2423	3.2603	323.9	868.9	1192.7	0.5058	1.0705	1.5763	352.0
356.0	145.424	0.01806	3.0863	3.1044	328.1	865.5	1193.6	0.5110	1.0611	1.5721	356.0
360.0	153.010	0.01811	2.9392	2.9573	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360.0
364.0	160.903	0.01816	2.8002	2.8184	336.5	858.6	1195.2	0.5212	1.0424	1.5637	364.0
368.0	169.113	0.01821	2.6691	2.6873	340.8	855.1	1195.9	0.5263	1.0332	1.5595	368.0
372.0	177.648	0.01826	2.5451	2.5633	345.0	851.6	1196.7	0.5314	1.0240	1.5554	372.0
376.0	186.517	0.01831	2.4279	2.4462	349.3	848.1	1197.4	0.5365	1.0148	1.5513	376.0
380.0	195.729	0.01836	2.3170	2.3353	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380.0
384.0	205.294	0.01842	2.2120	2.2304	357.9	840.8	1198.7	0.5466	0.9966	1.5432	384.0
388.0	215.220	0.01847	2.1126	2.1311	362.2	837.2	1199.3	0.5516	0.9876	1.5392	388.0
392.0	225.516	0.01853	2.0184	2.0369	366.5	833.4	1199.9	0.5567	0.9786	1.5352	392.0
396.0	236.193	0.01858	1.9291	1.9477	370.8	829.7	1200.4	0.5617	0.9696	1.5313	396.0
400.0	247.255	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400.0
404.0	258.729	0.01870	1.7640	1.7827	379.4	822.0	1201.5	0.5717	0.9518	1.5234	404.0
408.0	270.605	0.01875	1.6877	1.7064	383.8	818.2	1201.9	0.5766	0.9429	1.5195	408.0
412.0	282.894	0.01881	1.6153	1.6340	388.1	814.2	1202.4	0.5816	0.9341	1.5157	412.0
416.0	295.617	0.01887	1.5469	1.5657	392.5	810.2	1202.8	0.5866	0.9253	1.5118	416.0
420.0	308.780	0.01894	1.4809	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420.0
424.0	322.391	0.01900	1.4184	1.4374	401.3	802.2	1203.5	0.5964	0.9077	1.5042	424.0
428.0	336.463	0.01906	1.3591	1.3782	405.7	798.0	1203.7	0.6014	0.8990	1.5004	428.0
432.0	351.00	0.01913	1.30266	1.32179	410.1	793.9	1204.0	0.6063	0.8903	1.4966	432.0
436.0	366.03	0.01919	1.24887	1.26806	414.6	789.7	1204.2	0.6112	0.8816	1.4928	436.0
440.0	381.54	0.01926	1.1976	1.21687	419.0	785.4	1204.4	0.6161	0.8729	1.489	440.0
444.0	397.56	0.01933	1.14874	1.16806	423.5	781.1	1204.6	0.6210	0.8643	1.4853	444.0
448.0	414.09	0.01940	1.10212	1.12152	428.0	776.7	1204.7	0.6259	0.8557	1.4815	448.0
452.0	431.14	0.01947	1.05764	1.07711	432.5	772.3	1204.8	0.630	0.847	1.477	452.0
456.0	448.72	0.01954	1.01518	1.03472	437.0	767.8	1204.9	0.6356	0.8385	1.474	456.0

Table 1. Saturated Steam: Temperature Table—*Continued*

Temp Fahr t	Abs Press Lb per Sq in p	Specific Volume Sat Liquid v_f	Evap v_{fg}	Sat Vapor v_g	Enthalpy Sat Liquid h_f	Evap h_{fg}	Sat Vapor h_g	Entropy Sat Liquid s_f	Evap s_{fg}	Sat Vapor s_g	Temp Fahr t
460.0	466.87	0.01961	0.97463	0.99424	441.5	763.2	1204.8	0.6405	0.8796	1.4704	460.0
464.0	485.56	0.01969	0.93588	0.95557	446.1	758.6	1204.7	0.6454	0.8213	1.4667	464.0
468.0	504.83	0.01976	0.89885	0.91862	450.7	754.0	1204.6	0.6502	0.8127	1.4629	468.0
472.0	524.67	0.01984	0.86345	0.88329	455.2	749.3	1204.5	0.6551	0.8042	1.4592	472.0
476.0	545.11	0.01992	0.82958	0.84950	459.9	744.5	1204.3	0.6599	0.7956	1.4555	476.0
480.0	566.15	0.02000	0.79716	0.81717	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480.0
484.0	587.81	0.02009	0.76613	0.78622	469.1	734.7	1203.8	0.6696	0.7785	1.4481	484.0
488.0	610.10	0.02017	0.73641	0.75658	473.8	729.7	1203.5	0.6745	0.7700	1.4444	488.0
492.0	633.03	0.02026	0.70794	0.72820	478.5	724.6	1203.1	0.6793	0.7614	1.4407	492.0
496.0	656.61	0.02034	0.68065	0.70100	483.2	719.5	1202.7	0.6842	0.7528	1.4370	496.0
500.0	680.86	0.02043	0.65448	0.67492	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500.0
504.0	705.78	0.02053	0.62938	0.64991	492.7	709.0	1201.7	0.6939	0.7357	1.4296	504.0
508.0	731.40	0.02062	0.60530	0.62592	497.5	703.7	1201.1	0.6987	0.7271	1.4258	508.0
512.0	757.72	0.02072	0.58218	0.60289	502.3	698.2	1200.5	0.7036	0.7185	1.4221	512.0
516.0	784.76	0.02081	0.55997	0.58079	507.1	692.7	1199.8	0.7085	0.7099	1.4183	516.0
520.0	812.53	0.02091	0.53864	0.55956	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520.0
524.0	841.04	0.02102	0.51814	0.53916	516.9	681.3	1198.2	0.7182	0.6926	1.4108	524.0
528.0	870.31	0.02112	0.49843	0.51955	521.8	675.5	1197.3	0.7231	0.6839	1.4070	528.0
532.0	900.34	0.02123	0.47947	0.50070	526.8	669.6	1196.4	0.7280	0.6752	1.4031	532.0
536.0	931.17	0.02134	0.46123	0.48257	531.7	663.6	1195.4	0.7329	0.6665	1.3993	536.0
540.0	962.79	0.02146	0.44367	0.46513	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540.0
544.0	995.22	0.02157	0.42677	0.44834	541.8	651.3	1193.1	0.7427	0.6489	1.3915	544.0
548.0	1028.49	0.02169	0.41048	0.43217	546.9	645.0	1191.9	0.7476	0.6400	1.3876	548.0
552.0	1062.59	0.02182	0.39479	0.41660	552.0	638.5	1190.6	0.7525	0.6311	1.3837	552.0
556.0	1097.55	0.02194	0.37966	0.40160	557.2	632.0	1189.2	0.7575	0.6222	1.3797	556.0
560.0	1133.38	0.02207	0.36507	0.38714	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560.0
564.0	1170.10	0.02221	0.35099	0.37320	567.6	618.5	1186.1	0.7674	0.6041	1.3716	564.0
568.0	1207.72	0.02235	0.33741	0.35975	572.9	611.5	1184.5	0.7725	0.5950	1.3675	568.0
572.0	1246.26	0.02249	0.32429	0.34678	578.3	604.5	1182.7	0.7775	0.5859	1.3634	572.0
576.0	1285.74	0.02264	0.31162	0.33426	583.7	597.2	1180.9	0.7825	0.5766	1.3591	576.0
580.0	1326.17	0.02279	0.29937	0.32216	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580.0
584.0	1367.6	0.02295	0.28753	0.31048	594.6	582.4	1176.9	0.7927	0.5580	1.3507	584.0
588.0	1410.0	0.02311	0.27608	0.29919	600.1	574.7	1174.8	0.7978	0.5485	1.3464	588.0
592.0	1453.3	0.02328	0.26499	0.28827	605.7	566.8	1172.6	0.8030	0.5390	1.3420	592.0
596.0	1497.8	0.02345	0.25425	0.27770	611.4	558.8	1170.2	0.8082	0.5293	1.3375	596.0
600.0	1543.2	0.02364	0.24384	0.26747	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600.0
604.0	1589.7	0.02383	0.23374	0.25757	622.9	542.2	1165.1	0.8187	0.5097	1.3284	604.0
608.0	1637.3	0.02402	0.22394	0.24796	628.8	533.6	1162.4	0.8240	0.4997	1.3238	608.0
612.0	1686.1	0.02422	0.21443	0.23865	634.8	524.7	1159.5	0.8294	0.4896	1.3190	612.0
616.0	1736.9	0.02444	0.20518	0.22960	640.8	515.6	1156.4	0.8348	0.4794	1.3141	616.0
620.0	1789.9	0.02466	0.19615	0.22081	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620.0
624.0	1843.0	0.02489	0.18737	0.21226	653.1	496.6	1149.8	0.8458	0.4583	1.3041	624.0
628.0	1897.4	0.02514	0.17880	0.20394	659.5	486.7	1146.1	0.8514	0.4474	1.2988	628.0
632.0	1953.0	0.02539	0.17044	0.19583	665.9	476.4	1142.2	0.8571	0.4364	1.2934	632.0
636.0	2009.8	0.02566	0.16226	0.18792	672.4	465.7	1138.1	0.8628	0.4251	1.2879	636.0
640.0	2068.0	0.02595	0.15427	0.18021	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640.0
644.0	2127.3	0.02625	0.14644	0.17269	685.9	443.1	1129.0	0.8747	0.4015	1.2761	644.0
648.0	2187.9	0.02657	0.13876	0.16534	692.9	431.1	1124.0	0.8809	0.3893	1.2699	648.0
652.0	2249.7	0.02691	0.13124	0.15816	700.0	418.7	1118.7	0.8874	0.3767	1.2634	652.0
656.0	2312.7	0.02728	0.12387	0.15115	707.4	405.7	1113.1	0.8941	0.3637	1.2567	656.0
660.0	2376.9	0.02768	0.11663	0.14431	714.9	392.1	1107.0	0.9010	0.3502	1.2498	660.0
664.0	2442.3	0.02811	0.10947	0.13757	722.9	377.7	1100.6	0.9084	0.3361	1.2425	664.0
668.0	2508.9	0.02858	0.10229	0.13087	731.5	362.1	1093.5	0.9162	0.3210	1.2347	668.0
672.0	2576.6	0.02911	0.09514	0.12424	740.2	345.7	1085.9	0.9247	0.3054	1.2266	672.0
676.0	2645.8	0.02970	0.08799	0.11769	749.2	328.5	1077.6	0.9337	0.2892	1.2179	676.0
680.0	2716.6	0.03037	0.08080	0.11117	758.5	310.1	1068.5	0.9435	0.2720	1.2086	680.0
684.0	2788.1	0.03114	0.07349	0.10463	768.2	290.2	1058.4	0.9542	0.2537	1.1984	684.0
688.0	2860.4	0.03204	0.06595	0.09799	778.8	268.2	1047.0	0.9659	0.2337	1.1872	688.0
692.0	2933.5	0.03313	0.05797	0.09110	790.5	243.1	1033.6	0.9788	0.2110	1.1744	692.0
696.0	3007.4	0.03455	0.04916	0.08371	804.4	212.8	1017.2	0.9949	0.1841	1.1591	696.0
700.0	3082.3	0.03667	0.03857	0.07519	822.4	172.7	995.2	1.0161	0.1490	1.1390	700.0
702.0	3119.6	0.03874	0.03173	0.07047	835.0	144.7	979.7	1.0306	0.1246	1.1252	702.0
704.0	3157.2	0.04108	0.02197	0.06305	854.2	107.0	956.2	1.0519	0.0876	1.1044	704.0
705.0	3176.1	0.04427	0.01304	0.05730	873.0	61.4	934.4	1.0729	0.0557	1.0859	705.0
705.47*	3208.2	0.05078	0.00000	0.05078	906.0	0.0	906.0	1.0612	0.0000	1.0612	705.47*

*Critical temperature

QUESTION 6.01 (1.00)

Briefly describe how the Tech Spec required BIT minimum level is assured during normal plant operation.

QUESTION 6.02 (2.25)

Describe the actions and loading of the vital ESS busses of the Zion station under the following conditions:

A.A station loss of off-site power (blackout) occurs 30 seconds after an ESF actuation has occured. Assume off-site power was available initially. [.75]

B.An ESF actuation occurs 5 minutes after a station blackout. [.75]

C.A blackout occurs after the ESF signal has been 'reset' to allow realignment to the recirculation phase after an accident. [.75]

QUESTION 6.03 (1.75)

Zion Unit 1 is operating at 85% power equilibrium conditions when a Thot instrument fails high. Describe how this failure will affect the following. Assume all control systems are in automatic and no operator action.Consider each of the below items seperately and independent from the others.

A.Rod insertion limit alarm setpoint
B.Positive Displacement pump speed control
C.Control Rod Bank Position
D.OP-Delta T trip setpoint for the affected loop
E.Steam Dump Load Rejection Controller output [.35 ea]

QUESTION 6.04 (1.50)

How will the following CVCS valves fail on a loss of control air (OPEN, CLOSED, AS-IS, VCT, PRT, or HUT):

A.VCB149A (Letdown Orifice Isolation Valve)
B.VC~~182~~ 8152 (Containment Letdown Isolation Valve)
C.PCV131 (Low Pressure Letdown Control Valve)
D.TCV129 (Letdown Temperature Divert Valve)
E.VCB167 (Deborating Control Valve) [.3 ea]

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

QUESTION 6.05 (2.25)

When the temperature of the RCS is less than 250 degrees F and the head is installed, what 3 means are available to protect the RCS from overpressurization due to a pressure transient per Tech Specs?

QUESTION 6.06 (1.00)

The reactor is in hot shutdown with RCS pressure at 1775 psig. The reactor trip breakers have been reset and the shutdown banks are full out. You are the SRO and I & C maintenance wants to perform a calibration on the Turbine Impulse pressure channels. Will you allow him to do this? Defend your answer.

QUESTION 6.07 (1.50)

What 2 design features does the Zion Station have that limits the severity of a cold water accident?

QUESTION 6.08 (1.00)

Following an ECCS actuation, the transition from cold leg to hot leg recirculation is made after 19 hours. Briefly explain WHY 19 hours was selected.

QUESTION 6.09 (1.00)

What 3 action(s) occur in the water supply system for the water Fire Protection on an "S" signal?

QUESTION 6.10 (1.50)

What are 5 conditions required for ACB 1473 Emergency Feed to bus 147 from Diesel Generator "D" to automatically close? [.3 ea]

QUESTION 6.11 (1.00)

Briefly describe the DC Control Power ground detection system.

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

QUESTION 6.12 (1.00)

A.Answer the following TRUE or FALSE.

RHR valve 8700A can only be opened from the MCB provided the following valves are closed:RH8811A(B)
RH8804A(B)
Both CS0049 and 0050 [.5]

B.Briefly explain your reason for choosing your answer. [.5]

QUESTION 6.13 (1.50)

One of the causes of an URGENT FAILURE in a power cabinet of the Rod Control System is a REGULATION FAILURE. Answer the following concerning this failure:

A.What are the 2 causes of this failure? [.75]

B.What does it protect against? [.75]

QUESTION 6.14 (.75)

What are the 3 causes of the CMPTR ALARM/NIS RAD TILT/ROD DEV/SEQ alarm?

QUESTION 6.15 (1.50)

What do the following trips protect against:

A.Low Pressurizer Pressure
B.Over power Delta T
C.High Steam Generator Water Level
D.Under Frequency on RCP
E.High Pressurizer Level [.3 ea]

QUESTION 6.16 (1.50)

How are the RCP Thermal Barrier Heat Exchangers protected from an RCS leak or rupture? List 5.

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

QUESTION 6.17 (1.50)

PCV 455C (PORV) control switch is a 3 position switch located on the Main Control Board. Answer the following.

A. What is the purpose of each position? [.75]

B. How is an uncontrolled depressurization prevented on a failure of 455C in the full open position? [.75]

QUESTION 6.18 (1.50)

What is the purpose of the following permissives:

A. P-8

B. P-11

C. P-14 [.5 ea]

List setpoints & coincidence

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

QUESTION 7.01 (1.50)

During a recovery from an inadvertant Safety Injection, under what 3 conditions must the Safety Injection be manually reinitiated?

QUESTION 7.02 (1.50)

Zion Unit 1 is operating at 85% power and utilizing the Motor Driven Feedwater pump due to a Steam Driven FW pump being out of service. With all plant systems in normal/auto, answer the following questions concerning a MDFW pump/Reactor trip:

A. What are 5 conditions that could cause the MDFW pump to trip. [.75]

B. What are 5 items that have to be verified by the NSO per EOP-1, Reactor Trip? [.75]

QUESTION 7.03 (2.50)

A. When is a Type 1 Radiation Work Permit required? [.75]

B. How long is a Type 1 RWP valid? [.50]

C. When is a Type 2 Radiation Work Permit required? [.75]

D. How long is a Type 2 RWP valid? [.50]

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

QUESTION 7.04 (1.00)

Answer the following TRUE or FALSE

A. RP 1190-1, "PERSONNEL EXPOSURES UNDER EMERGENCY CONDITIONS", recommends that for life saving situations a person shall not exceed 150 rem to the whole body.

B. The 10CFR20 limits for quarterly dose to the skin of the whole body shall not exceed 7.5 REM.

C. At the Zion Station each individual must have supervisory approval before exceeding a whole body dose equivalent of 50 mrem.

D. Weekly whole body dose equivalents in excess of 300 mrem must be approved by the Radiation-Chemistry Supervisor.

[.25 ea.]

QUESTION 7.05 (2.00)

A. What are 3 conditions the operator should maintain in order to enhance Natural circulation? [1.0]

B. What are 3 indications the operator will use to ensure natural circulation flow has been established and is adequate? [1.0]

QUESTION 7.06 (1.75)

A. Describe how RCS pressure is maintained when in the solid plant pressure control mode. Be SPECIFIC. [.75]

B. What is the major problem to the NSO when operating in this mode? [.25]

C. When is Nitrogen pressure control used instead of solid plant control? [.50]

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

QUESTION 7.07 (1.50)

Concerning a steam break accident, answer the following:

A. What are the indications the operator would see on the secondary side? List 3. [.75]

B. What indications would the operator see on the primary side? List 3. [.75]

QUESTION 7.08 (1.25)

List 2 (two) starting and restarting requirements for the Reactor Coolant Pumps?

QUESTION 7.09 (2.00)

Concerning a reactor startup per GOP-2, fill in the blanks for the following:

A. The minimum required overlap between Source Range and Intermediate Range channels is _____. [.2]

B. Following achieving criticality, you establish a Startup Rate of _____DPM and DO NOT exceed a stable Startup Rate of _____ DPM. [.4]

C. The POINT OF ADDING HEAT is identified by the operator when _____, _____, and _____. [.6]

D. Bank D rods will begin to withdraw when Bank C reaches _____ steps. [.2]

E. The ROD BOTTOM LIGHT ANNUNCIATOR clears and CONTROL BANK A BOTTOM lights are off when rods are above ___ steps. [.2]

F. Verify that the Intermediate Range channels begin to respond when the Source Range channels are reading between ____ and _____ CPS. [.4]

QUESTION 7.10 (1.50)

Per EOP-0, SAFETY INJECTION, what is/are the criteria for stopping the RCP's in an accident condition?

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

QUESTION 7.11 (2.00)

Per EOP-1, Reactor Trip, answer the following:

A. What actions are required of the operator if 4 rods stick out? [1.0]

B. What actions are required if the turbine does not trip? [1.0]

QUESTION 7.12 (1.00)

GOP-1 states that 1C RCP on Unit 1 must be started first on a startup. Why is this precaution necessary?

QUESTION 7.13 (2.00)

A. What are 3 indications that a #1 Reactor Coolant Pump seal has failed open? [1.0]

B. What are 3 required actions the NSO must take immediately? [1.0]

QUESTION 7.14 (2.00)

A. What are the 4 ways used at Zion to perform an Emergency Boration? [1.0]

B. What are the 4 conditions that require emergency boration? [1.0]

QUESTION 7.15 (1.50)

Per EOP-9, LOSS OF REACTOR COOLANT, when can SI be terminated?

(xxxxx END OF CATEGORY 07 xxxxx)

QUESTION 8.01 (2.50)

For the following statements from ZAP 10-52-3, "Shift Manning, Relief, and Turnover", fill in the blanks (may be multiple word answers).

A. Operating personnel working on safety related equipment should not be permitted to work more than ___ hours in any ___ hour period, nor more than ___ hours in any ___ hour period, nor more than ___ hours in any ___ day period.

B. An operator is not "at the controls" when _____ or _____.

C. The oncoming Shift Engineer and Radwaste Foreman will obtain awareness of shift activities by use of the _____.

D. The _____ provides a mechanism for the dissemination of instructions which are general and of continuing applicability to the conduct of operations

[.25 ea]

QUESTION 8.02 (2.25)

On May 5th a valve lineup was performed on No.1 Centrifugal Charging pump to place it in service following routine maintenance. An entry is included in the Standing Orders to minimize useage of the pump. On May 18th an Auxiliary Operator reports that the discharge valve is closed and can not be physically opened. Answer the following.

A. Is the pump OPERABLE per Tech Specs? [.75]

B. Has the Tech Spec LCO been violated? [.75]

C. How long can the pump be left in this condition? [.75]

QUESTION 8.03 (1.50)

A. What are the requirements for the fire brigade on the back shifts? [.75]

B. Under what conditions can the minimum shift manning required per Tech Specs be less than required?
[.75]

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

QUESTION 8.04 (1.00)

Per the Tech Spec's interpretations, explain what the intent of 'IMMEDIATELY SHUTDOWN' is when it is found in the action statements.

QUESTION 8.05 (2.00)

A. What 7 people/plant positions have to review a lifted lead request for a safety related component once the REQUESTER initiates it? Include all signatures up to actual installation. [1.4]

B. Which of the above three individuals would not have to sign the request if it were for a non-safety component? [.6]

QUESTION 8.06 (.50)

Choose the CORRECT response. A NON-ROUTINE VALVE LINEUP AUTHORIZATION must be signed by:

A. Center Desk NSO and Operating Engineer

B. Shift Foreman and Center Desk NSO

C. Shift Engineer and Shift Foreman

D. Unit NSO and Shift Foreman

QUESTION 8.07 (2.00)

A. When is management verification by a licensed Shift Supervisor necessary when completing an OUT OF SERVICE card? [1.0]

B. When shall the 'PARTIAL CLEAR' procedure NOT be used regarding safety tags? Personal Protection Tags [1.0]

QUESTION 8.08 (2.00)

Per EPIP 360-1, site evacuation SHALL commence following the completion of personnel accountability unless 4 conditions exist. List the 4 conditions.

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

QUESTION 8.09 (1.75)

A. Who assumes the position of Station Director during a GSEP Emergency? [.75]

B. List the 4 people in order of preference that can assume the position if the person in A above is not available. [1.0]

QUESTION 8.10 (2.00)

Per Technical Specifications, are the following components operable based on the below information (YES/NO only-no explanation required):

A. SI pump is started manually from the MCB and the discharge pressure and recirc flow is within +/- 15% of a point on the pump head curve.

B. RWST boron concentration is 1900 PPM.

C. BIT contains 900 gallons of 11.5 to 13% by weight Boric Acid at a temperature of 145 degrees F.

D. During a refueling outage, the Main Steam Isolation valves are tested and stroke from full open to full closed in 30 seconds. [.50 ea]

QUESTION 8.11 (1.00)

The normal supply breaker to No.1 Safety Injection pump is tagged out by Electrical Maintenance and during an inspection determined to be malfunctioning. Parts need to be ordered and it will be out of service for 2 weeks. No other parts exist in the Edison system and no spare breakers are available. What is your required action as the SRO in reguard to continuing plant operations?

QUESTION 8.12 (2.00)

What is the responsibility of the Shift Engineer in regard to HIGH RADIATION AREA ACCESS CONTROL? List 4.

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

QUESTION 8.13 (2.00)

What are the conditions that have to be satisfied in order to enter the incore shaft area? List 3.

QUESTION 8.14 (1.00)

Per the Zion Station Fuel Handling procedures, what is the HIGH FLUX AT SHUTDOWN alarm setting during a refueling?

QUESTION 8.15 (1.50)

Per ZAP 5-51-4, PROCEDURE CONTROL AND APPROVAL, what is the difference between a SPECIAL PROCEDURE CHANGE and a TEMPORARY PROCEDURE CHANGE?

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

$f = ma$

$v = s/t$

$w = mg$

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

$E = mc^2$

$KE = 1/2\ mv^2$

$a = (V_f - V_o)/t$

$PE = mgh$

$w = \theta/t$

$V_f = V_o + at$

$W = V\ \Delta P$

$\Delta E = 931\ \Delta m$

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

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

$Pwr = W_f \Delta h$

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

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

$SUR = 25.06/T$

$SUR = 25\rho/\tau^* + (\beta - \rho)\bar{T}$

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

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

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

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

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

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

$\Sigma = \sigma N$

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

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

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

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

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

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

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

$TVL = 1.3/\mu$

$HVL = -0.693/\mu$

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

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

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

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

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

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

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

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

$I_1 d_1 = I_2 d_2$

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

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

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

Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 Atm = 2116 lbf/ft^2

Miscellaneous Conversions

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

EQUATION SHEET

$$\dot{Q} = \dot{m}\Delta h$$

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

$$\dot{Q} = \dot{m}c_p\Delta T$$

$$h_L = k\dot{m}V^2$$

$$DNBR = \frac{Q_c}{Q_x}$$

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

$$P = P_o e^{t/\tau}$$

$$SUR = \frac{26.06}{\tau}$$

$$\tau = \frac{\beta - \rho}{\lambda\rho}$$

$$\tau = \frac{l^*}{\rho} + \frac{\beta - \rho}{\lambda\rho}$$

$$\rho = \frac{k_{eff} - 1}{k_{eff}}$$

$$\Delta\rho = \frac{k_2 - k_1}{k_2 k_1}$$

$$\frac{CR_1}{CR_2} = \frac{1 - k_{eff_2}}{1 - k_{eff_1}}$$

$$RR = \Sigma_f \phi_{th}$$

$$SCR = \frac{S}{1 - k_{eff}}$$

$$M = \frac{CR_1}{CR_o}$$

$$\bar{\lambda} = 0.1 \text{ sec}^{-1}$$

$$l^* = 10^{-5} \text{ sec}$$

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

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

$$\rho = \Delta k/k$$

$$W_{total} = (h_{in} - h_{out})\eta_T$$

$$A = \lambda N$$

$$N = N_o e^{-\lambda t}$$

17.58 watts = 1 BTU/min

1 psi = 6.895 P_a

1 psi = 2.036 inches Hg @ 0°C

1 psi = 27.68 inches H_2O @ 4°C

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.01 (.50)
D. A
REF.W Fundamentals of Nuclear Rx Physics,p.8-9

~~C.~~
~~REF.Zion Curve Book~~

ANSWER 5.02 (.50)
B.
REF.W Fundamentals of Nuc Rx Physics,p.4-30

ANSWER 5.03 (.50)
D.
REF.W Fundamentals of Nuc Rx Physics,Ch 4

ANSWER 5.04 (.50)
C.
REF.W Fundamentals of Nuc Rx Physics

ANSWER 5.05 (.50)
D.
REF.W Fundamentals of Nuc Rx Physics,Ch 4

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.06 (.50)

A.

REF.W Fundamentals of Nuc Rx Physics,Ch 4

ANSWER 5.07 (.50)

B.

REF.Fundamentals of Nuc Rx Physics,Ch 6

ANSWER 5.08 (.50)

C.

REF.Fundamentals of Nuc Rx Physics,Ch 6

ANSWER 5.09 (.50)

A.

REF.Fundamentals of Nuc Rx Physics, Ch 3

ANSWER 5.10 (.50)

A.

REF.Fundamentals of Nuc Rx Physics, Ch 6

ANSWER 5.11 (.50)

D.

REF.Fundamentals of Nuc Rx Physics, Ch 6

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.12 (.50)

B.

REF.Fundamentals of Nuc Rx Physics, Ch 5

ANSWER 5.13 (.50)

A.

REF.Fundamentals of Nuc Rx Physics, Ch 5

ANSWER 5.14 (.50)

A.

REF.W Lg Press Wtr Rx Core Control, Ch 8

ANSWER 5.15 (.50)

D.

REF.TS,section 3.2.2.A.5

ANSWER 5.16 (.50)

B.

REF.TS,section 3.2.2.A.6

ANSWER 5.17 (.50)

D.

REF.

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.18 (.50)

C.

REF.TS,section 3.2.2.B.3

ANSWER 5.19 (.50)

A.

REF. C-24,p.19

ANSWER 5.20 (.50)

D.

REF.Steam Tables

ANSWER 5.21 (.50)

A.

REF.W Thermo-Hydraulic Principles,Ch 10

ANSWER 5.22 (1.25)

Decay heat comes from two principle sources.

a. Fission fragments in the fuel decay by alpha, beta, and gamma decay radiation. The fuel and core internals absorb the radiation and heat is generated. (.50)

b. 'Source' decay heat in cores comes from activated isotopes (plutonium, americium, and curium) that spontaneously fission and create additional fissions or more likely create more fission fragments to decay. (Can be 10-20% of total decay heat). (.50)

REF: W Fundamentals of Nuc Rx Physics, Ch 2

ALTERNATE FISSION FRAGMENTS IN THE FUEL DECAY BY ALPHA, BETA, & GAMMA DECAY RADIATION. THE FUEL & CORE INTERNALS ABSORB THE RADIATION AND HEAT IS GENERATED. TAVE INCREASED ABOVE 547°F. STM PRESSURE INCREASED ABOVE ICS AND STM DUMP OPERATE TO CONTROL TAVE AT 547°F

ANSWERS -- ZION 1&2 -83/06/17-R.R.FERRELL

ANSWER 5.23 (1.50)

a. Increase [.75]
b. Decrease [.75]

REFERENCE
W Thermo-Hydraulic Principles, Ch 10

ANSWER 5.24 (2.25)

A. To prevent an unexpected power excursion during normal operations as a result of either a moderator temperature increase or a decrease of coolant pressure
B. Low power physics testing
C. At coolant temperatures below the power range; BOL when Cb is at the greatest [.75 ea]

REF. TS, 3.2, p.64

ANSWER 5.25 (1.75)

A. NPSH=Pstatic + Pdynamic - Psat

B. 1. Increase
2. Decrease (due to increase in suction piping Hl)
3. Decrease (due to increase in fluid saturation temperature)

REF. W Thermo-Hydraulic Principles, Ch 4

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.26 (1.20)

From Figure 5-3:PD at 50%-PD at 10%

$$653\ PCM = \frac{600 - X\ PCM}{600 - 680\ PCM} \times \frac{1200 - 1000\ PPM}{1200 - 900\ PPM}$$

From Figure 5-4:Differential Boron Worth = -10.4 PCM/PPM

From Figure 5-5:Initial Boron Concentration = 1000 PPM

$$\text{Boron Dilution} = \frac{653\ PCM}{-10.4\ PCM/PPM} = 63\ PPM$$

Dilution Water in gallons = 4000 gallons

OR

The equation given from Figure 5-5 may be used to determine the volume. The typical value for the Mass of water in the primary is 504,000 lbs.

$$Vw = \frac{504{,}000\ lbs}{8.33} \ln\left(\frac{1000}{1000-63}\right) = 3937\ gallons = Vw$$

REF.Large PWR Core Control, p.5-27-28

ANSWER 5.27 (2.30)

A.Doubles [.40]

B.Stays the same [.40]

C.~~Doubles~~ QUADRUPLES [.40]

D.Head approaches 0 at maximum flow [.5]

E.1.Excessive noise and vibration
2.Fluctuating discharge pressure
3.Fluctuating motor current
4.Reduction in pump capacity and efficiency [.15 ea]

REF.W Thermo-Hydraulic Principles,Ch 10

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 5.28 (.50)

D.

REF.W Rx Core Control for Large PWR's, Ch 6

ANSWER 5.29 (.50)

B,D

REF.W Rx Core Control for Large PWR's, Ch 6

ANSWER 5.30 (1.75)

1.CR move in a single bank
2.No individual rod more than 15 inches from bank demand
3.Control banks sequenced/overlap
4.RIL maintained
5.Delta I in band [.35 ea]

REF.C 35,p.39

ANSWER 5.31 (1.50)

Undercompensated [.5]; When overcompensated the operator has no idea what IR level really is while when undercompensated the operator knows'at least' (conservative direction) where power is. [1.0]

REF.WTC-HO-9.p.16

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 6.01 (1.00)

BIT is continiously recirculated by the BA transfer pumps.

REF.TS 3.8.1.E

ANSWER 6.02 (2.25)

A.Busses are stripped and ESF loads are sequenced on the bus

B.ESF loads not running are sequenced on bus; loads running on bus previous to this are on due to blackout sequence

C.Bus strips,blackout loads sequence on

REF.B-1-3,p.32-35

ANSWER 6.03 (1.75)

A.Increase; RIL computer sees the increase in Delta T

B.Increase; Pressurizer level program will indicate a higher level due to Tave increase

C.Rods move in to try to decrease the higher Tave the system sees

D.Decrease due to the higher Tave input giving it more penalty signal

~~E.Nothing reference level does not come from Tave~~

E.Output will increase but steam dumps will not actuate because they are not armed.

REF.C-33,34

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 6.04 (1.50)

A.CLOSED
B.CLOSED
C.OPEN
D.VCT
E.VCT [.3 ea]

REF.C-7-1,p.9-13

ANSWER 6.05 (2.25)

1.2 PORV's with a lift setting of 435 psig
2.1 PORV open
3.Pressurizer level less than 25% and pressure less than 100 psig
4.Only 1 charging pump operable

REF.TS,3.3.2.6,p.82-83

ANSWER 6.06 (1.00)

NO

Placing in test will deenergize the interlock circuit P-7 and unblock the low pressurizer pressure trip functions and will result in Rx protection actuation.

REF.C-34,Logic diagrams 5653D30 sh.4,6,8,16

ANSWER 6.07 (1.50)

1.RCS loop isolation valve interlock and the 25% trip on PR NI's (SU of an idle loop is supposed to be done < 10% power)

2.Flow restrictors in MS lines,heavy pipe restraints and auto protective features (closure of MSIV's and start of ECCS)

REF.C-9,p.11

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 6.08 (1.00)

Analysis of the solubility of boron within the upper regions of the core. Specifically at 212 degrees F the solubility of boric acid is 27.5 w/%. The concern is that should the solubility limit be reached, the boric acid would crystallize out and possibly restrict flow in the top of the core.

REF.C-11B,p.19

ANSWER 6.09 (1.00)

Shuts valves to Service Water Booster Pumps (SW0006/5),Booster Pumps trip, fire header pressure drops,fire pumps srart

REF.NPT-221,Chapter 6,p.5

ANSWER 6.10 (1.50)

5/7 at .3 ea

1.Main Feed ACB1471 over current trip relay reset
2.Reserve Feed breaker ACB1472 over current trip relay reset
3.Diesel Generator differential current relay reset
4.Main Feed breaker ACB 1471 open
5.Reserve Feed breaker ACB 1472 open
6.Diesel 'O' override relay energized
7.DC 'O' supply breaker to bus 247,ACB2473 open
REF.B-1-3,p.20

ANSWER 6.11 (1.00)

1.~~Deliberatly grounding the neutral or common connection of 3 phase windings~~

2.If a second ground should occur a sample current flow will be passed through the circuits 'S VOLTS TO GROUND ; NEGATIVE TO (GROUND) OR POSITIVE TO (GROUND)

REF.B-1-4,p.6

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 6.12 (1.00)

A.TRUE

B.Interlocks provided to insure the system is operated as designed. Only time you want to use RHR is to supply suction to Charging/SI/Containment spray and during this time the RWST would be empty and thus the Recirc sump would be the source of water for cooling the rx. These interlocks prevent inadvertantly draining the RWST to the Recirc sump.

REF.C-10,p.5-6

ANSWER 6.13 (1.50)

A.1.Coil current does not match the current order within a preset time
2.Full current is on too long [.75]

B.Protects agaist dropping a rod or overheating the coils [.75]

REF.C-33,p.26

ANSWER 6.14 (.75)

1.+/- 12 steps between 2 rods in a bank
2.+/- 12 steps between rods and bank demand signal
3.SD banks less than 220 steps [.25 ea]

REF.C-13,p.50

ANSWER 6.15 (1.50)

A.Steam void formation and degradation of DNBR
B.Overheating fuel cladding
C.Carryover
D.Overheating
E.Backup to high pressure trip/overstress piping

REF.C-34,p.9-11

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 6.16 (1.50)

1.Inlet-Check valve to prevent backleakage
2.All piping can withstand RCS pressure
3.Flow indicator
4.FCV 685 closes on high flow
5.Relief valve set at 2485 to protect piping [.3 ea]

REF.C-5,p.17

ANSWER 6.17 (1.50)

A.OPEN-opens valve
AUTO-set to open at 2335 psig
AUTO-LOW-set at 435 by PT 403 when RCS is < 250 degrees F

B.Interlocked with channel 458 to close at 1835 psig
CLOSE BLOCK VALVE

REF.C-6,p.9

ANSWER 6.18 (1.50)

A.P-8: > 60% single loop low flow Rx trip is auto unblocked;2/4 PRNI [.5]

B.P-11: 2/3 pressurizer pressure channels < 1915 psig operator can block the low pressure SI [.5]

C.P-14: 2/3 narrow range instruments in 1/4 SG's at > 70%, the Feed Reg and bypasses close, MFP's trip, and Main Turbine trips [.5]

REF.C-34,p.17-18

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 7.01 (1.50)

1.Pressurizer pressure decreases below 1815 psig
2.Pressurizer level decreases below 10%
3.RCS subcooling drops below 35 degrees F [.50 ea]

REF.EOP-0,appendix B,p.10

ANSWER 7.02 (1.50)

A.1.Loss of all condensate/condensate booster pumps
2.Hi-Hi S/G level or SI
3.Lo Lube Oil pressure at 4 psig
4.4KV bus under voltage
5.electrical overload
6.System Aux Transformer 142 trips
7.Generator 86-G1 (G2) or 86-G1B(G2B) relay trip [5/7 at .15 ea.]

B.1.Verify reactor trip
2 Verify turbine trip
3.Verify AFW flow
4.Verify pressurizer pressure/level begin to recover
5.Verify generator trip 50 seconds later
6.Annotate reactor trip over the page [5/6 at .15 ea]

ANSWER 7.03 (2.50)

A.All routine access or work in radiologically controlled areas where personnel are NOT expected to exceed a whole body dose equivalent of 50 mrem/day [.75]
B.Max of 1 year from January 1. [.50]
C.All access work in radiologically controlled areas where personnel are expected to exceed a whole body dose equivalent of 50 mrem/day; jobs involving significant contamination and/or airborne radioactivity may require one. [.75]
D.Length of the job. [.50]
F.RP 1190-1,p.12-15

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 7.04 (1.00)

A.FALSE
B.TRUE
C.TRUE
D.TRUE

REF.RP 1190-1,p.30

ANSWER 7.05 (2.00)

A.1.Pressurizer level >/= 50%
2.Pressurizer pressure > 2000 psia
3.SG level in NR in at least 1 SG (feed/steaming that SG) [.33 ea]

B.1.RCS Delta T </= 1.2 x full load Delta T
2.RCS or core exit thermocouple temperatures constant or decreasing
3.SG pressure constant or decreasing at a rate ~ rate of decrease of RCS while maintaining SG level with continuous AFW [.33 ea]

REF.NPD-229,Ch.5,p.32
ECF 7, APPENDIX A

ANSWER 7.06 (1.75)

A.Balance between charging and letdown-HCV128 full open, PCV131 in auto or manual; Charging:FCV121 or PDP speed control [.75]

B.Lifting of relief valves [.25]

C.Nitrogen-long duration shutdown or access to RCS
Solid-< 24 hours shutdown or does not require breaching RCS integrity [.50]

REF.NPS 229

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 7.07 (1.50)

A.Low steam pressure
High steam flow rate
Initial high steam generator levels-swell [.25 ea]

B.Falling Tave
Low pressurizer pressure
Low pressurizer level [.25 ea]

REF.C-9,p.11

ANSWER 7.08 (1.25)

1.Restart should not be attempted until motor has been allowed to cool by standing idle for a period of not less than 30 minutes.
2.Within any 2 hour period, number of starts should be limited to max of 3 with a minimum wait of 30 minutes; 4th start should not be attempted until motor has been allowed to cool for at least 1 hour. [.625 ea]

REF.C-5,p.16

ANSWER 7.09 (2.00)

A.1 decade
B..75,1.0
C.Decreasing SUR, Increasing RCS temperature, Increasing pressurizer pressure (Increasing pressurizer level)
D.179
E.20
F.1000, 10,000

REF.GOP-2,p.12-14

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 7.10 (1.50)

After verification of at least 1 CCP or SI pumps in service AND when the wide range RCS pressure drops below 1200 PSIG (1520 for adverse containment where containment pressure is 5 psig or greater).

OR

Within 5 minutes after losing CCW to RCP's.

REF.EOP-0,p.7

ANSWER 7.11 (2.00)

A.Borate 400 PPM and determine required boron concentration [1.0]

B.Reinitiate turbine trip or attempt to close valves manually. [1.0]

C. Close MSIV.

REF.EOP-1,p.5

EOP-1, p4

ANSWER 7.12 (1.00)

May trip against backflow when other pumps are in operation

REF.GOP-1,p.23

ANSWER 7.13 (2.00)

A.1.No.1 seal flow high > 6 gpm
2.RCP seal wtr outlet temp high after verifying adequate CC flow
3.No.1 seal delta P <250 PSID [.33 ea]

B.1.Close leak off valve within 5 min
2.Initiate unit shutdown and be in hot standby within 1 hour
3.Stop pump when at hot shutdown [.33 ea]

REF.AOP-2

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 7.14 (2.00)

A.BAT>BATP>Charging Pump Suction via:1.Emergency Boration Vlv MOV8104
2.Manual Emergency Boration Vlv VC8439
3.VC FC0110A and FCV0110B
CCP>BIT>Cold Leg Discharge Vlvs [.25 ea]

B.1.Control Rod Height less than bank limit Lo-Lo point with the reactor critical
2.Failure of 2 or more RCCA to fully insert on a trip or shutdown
3.Unexplained/uncontrolled reactivity increase
4.Failure of RCMS to extent that bypass is necessary [.25 ea]

REF.EOP-5

ANSWER 7.15 (1.50)

RCS pressure > 2000 PSIG
AND
Indicated pressurizer level > 50% of span
AND
RCS subcooling > 50 degrees F
AND
Water level in at least 1 SG in narrow range
OR
Water level in 1 SG stable and AFW flow > 420 GPM

REF.EOP-9

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 8.01 (2.50)

A.16,24,24,48,72,7

B.behind the panels,out of the control room

C.Turnover checklist

D.Standing order book

REF.ZAP 10-52-3

ANSWER 8.02 (2.25)

A.~~YES~~ NO
B.~~No~~ YES
C.7 days

REF.TS,3.8,p.165

ANSWER 8.03 (1.50)

A.5 members at all times and shall not include the minimum shift crew necessary for safe shutdown of the plant or personnel required for other essential functions during a fire emergency. [.75]

B.Shortage caused by sudden sickness or home emergency. [.75]

REF.TS,6.0,p.300
TS,6.0,TBL 6.1.2,p.331

ANSWER 8.04 (1.00)

Hot Shutdown within 4 hours

REF.TS Interpretations 79-1

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 8.05 (2.00)

A.Shift Foreman
Tech Staff
Operating Engineer
Station Superintendent
SCRE
Shift Engineer

B.Tech Staff
Operating Engineer
Station Superintendent

REF.ZAP 3-51-4

ANSWER 8.06 (.50)

C.

REF.ZAP 3-51-4B

ANSWER 8.07 (2.00)

A.When safety related systems are involved [1.0]

B.1.To modify the boundaries of an existing out-of-service job to accomidate additional work or system hydros.
2.To permit long term operation of equipment that can't be cleared for service due to outstanding Work Request or Modification related requirements. [.5 ea]

REF.ZAP 14-51-2

ANSWER 8.08 (2.00)

1.Severe weather conditions threaten safe transport.
2.A signficiant radiological hazard would be encountered.
3.There is a security threat occuring which would have an adverse impact on the personnel while leaving the site.
4.Conditions similar to these in magnitude which in the opinion of the Station Director would adversely affect the site personnel.

REF.EPIP 360-1

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 8.09 (1.75)

A.Station Superintendent or alternate [.75]

B.Shift Engineer
Shift foreman
Shift Control Room Engineer
Senior Experienced NSO [1.0]

REF.EPIP110-1,p.2

ANSWER 8.10 (2.00)

A.NO
B.NO
C.YES
D.NO

REF.Tech Specs

ANSWER 8.11 (1.00)

TS 3.05 applies-nothing required if the corresponding emergency source is available and all redundant systems are operable: 7 DAYS TOTAL OPERATION

REF.Tech Specs

ANSWER 8.12 (2.00)

1.Control of the 'R' keys issued through his office
2.Maintenance of a log book/clipboard for each 'R'key
3.Accounting for each 'R'key at end of shift
4.Forwarding filled out log sheets to the Office Supervisor
[.5 ea]

REF.ZAP 5-51-15

ANSWERS -- ZION 1&2 -85/06/17-R.R.FERRELL

ANSWER 8.13 (2.00)

1.Incore thimbles are in the reactor vessel
2.Incore detectors are taken out of service
3.Incore detectors are in the storage position or are inserted in the reactor vessel [.66 ea]

REF.ZAP 5-51-16, p.2

ANSWER 8.14 (1.00)

</= 5X steady source range counts but no ~~higher~~ LESS than 25

REF.FHI-00, p.3

ANSWER 8.15 (1.50)

Temporary Procedure change-intent of existing procedure SHALL not be changed
Special-SHOULD be used when an intent change is necessary

REF.ZAP 5-51-4