ENCLOSURE 1

EXAMINATION REPORT - 50-325/OL-86-02

Facility Licensee:

Carolina Power and Light Company

411 Fayetteville Street

Raleigh, NC 27602

Facility Name:

Brunswick Steam Electric Plant

Facility Docket No .:

50-325, 50-324

A written examination was administered at the United States Nuclear Regulatory Commission, Region II Offices, Atlanta, Georgia.

Chief Examiner:

Kenneth E Brockman

11-25-86

Date Signed

Approved by:

John F. Munro, Section Chief

11/20/86 Date Signed

Summary:

Examination on October 28, 1986.

One candidate was administered a written examination of Reactor Operator Section 2, which he passed.

REPORT DETAILS

- 1. Facility Employees Contacted:
 - *D. Shaw
 - *Attended Exit Meeting
- 2. Examiners:
 - *K. E. Brockman
 - *Chief Examiner
- 3. Examination Review Meeting

At the conclusion of the written examination, the examiner provided Mr. D. Shaw with a copy of the written examination and answer key for review. No technical comments were made concerning the exam. The licensee did not identify as propriety any of the material provided to or reviewed by the examiners.

U. S. HUCLEAR REGULATORY CO. "TSSION REACTOR OPERATOR LICENSE EXAM_NATION

FACILITY:

BRUNSHICK 182

REACTOR TYPE:

BWR-GE4

DATE ADMINISTERED: 86/10/21

EXAMINER:

BROCKMAN, K.

CANDIDATE

- MASTER -

INSTRUCTIONS TO CANDIDATE:

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 1% least 80%. Examination papers will be picked up six (6) hours after the examination starts.

| CATEGORY % OF VALUE TOTAL | | X OF CATEGORY VALUE | CATEGORY |
|------------------------------|-------------|---------------------------------------|--|
| 25.75 100.00 | | and the total line line, the line and | 2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS |
| 25.75 | | | |
| THE AND THE RES TAX TO | Final Grade | | |

All work done on this examination is my own. I have neither given

Candidate's Rignature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

- Chesting on the examination means an automatic denial of your application and could result in more severe penalties.
- 2. Restroom trips are to be limited and only one candidate at a time may leave. You wist aroid all contacts with anyone outside the examination room to avoid even the appearance or possibility of chesting.
- 2. Use black ink or dark pencil only to facilitate legible reproductions.
- 4. Print your name in the blank provided on the cover sheet of the examination.
- 5. Fill in the date on the cover sheet of the examination (if necessary).
- 6. Use only the paper provided for answers.
- 7. Print your name in the upper right-hand corner of the first page of each section of the ensuer sheet.
- 8. Consecutively nother each answer sheet: write "End of Category __ ' as appropriate; start each category on a new page: write only on one side of the paper: and write "Last Page" on the last answer sheet.
- 9. Number each answer as to category and number, for example, 1.4, 6.3.
- 10. Skip at least three lines between each answer.
- Geparate answer sheets from pad and place finished answer sheets face down on your desk or table.
- 12. Use abbreviations only if they are commonly used in facility literature.
- 12. The point value for each question is indicated in parentheses after the question and can be used as a guide for the depth of answer required.
- 14. Show all calculations: methods, or assumptions used to obtain an answer to mathematical problems whether indicated in the question or not.
- 15. Partial gradit may be given. Therefore: ANSWER ALL PARTS OF THE OUTSTION AND DO NOT LEAVE ANY ANSWER BLANK.
- 16. If parts of the examination are not clear as to intent, ask questions of the examiner only.
- 17. You must sign the statement on the cover sheet that indicates that the work is your own and you have not received or been given assistance in completing the examination. This must be done after the examination has been completed.

18. When you complete your examination, you shall:

- a. Assemble your examination as follows:
 - (1) Exam questions on top.
 - (2) Exam aids figures: tables: etc.
 - (3) Answer pages including figures which are part of the answer.
- b. Turn in your copy of the examination and all pages used to answer the examination questions.
- c. Turn in all scrap paper and the balance of the paper that you did not use for answering the questions.
- d. Leave the examination area, as defined by the examiner. If after leaving, you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION 2.01 (2.00)

DESCRIBE how the Core Spray System piping break detection system confirms the integrity of the Core Spray piping. Include in your answer:

- (a). What piping integrity is verified AND why?
- (b). sensing points,
- (c). normal readings AND how system operability changes when a break occurs.

QUESTION 2.02

(1.50)

a. FILL IN THE BLANK!

Main Steam Isolation Valve closure time must be between (0.5)

b. DESCRIBE the basis for these closure times.

(1.0)

QUESTION 2.03 (1.25

LIST 5 signals that would cause the Main Steam Line Isolation valves (MSIV's) to isolate. SETPOINTS ARE NOT REQUIRED

DHESTIAN 2.04 (2.00)

LIST all initiation signals/ permissives that must be met for the Automatic Depressur zation System (ADS) to initiate. SETPOINTS ARE REQUIRED

QUESTION 2.05 (1.00)

Scram Outlet valve(CV-127) operates faster than Scram Inlet valve(CV-126). DESCRIBE why this occurs AND how it is accomplished.

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

QUESTION 2.06 (1.00)

STATE TWO (2) reasons for maintaining the HPCI system fully flooded (ie. keep fill system).

QUESTION 2.07 (1.00)

LIST the normal bus power supplies of the Unit 1 RHR pumps.

QUESTION 2.08 (1.00)

WHICH of the following describes how, a loss of instrument air would effect the operation of Standby Liquid Control (SBLC)?

- (a). The SELC tank level indication would be inoperable.
- (b). The SELC tank air sparger would be inoperable.
- (c). The SELC tank level indication and air sparger would be inoperable.
- (d). It would have NO impact since the service air system supplies all SBLC needs.

QUESTION 2.09 (1.50)

Each of the events listed below would cause the Reactor Water Cleanup system to ISOLATE. For each event, STATE whether the Inboard Isolation valve (F001) AND/OR the Outboard Isolation valve (F004) would automatically close.

- (a). Loss of cooling water to the NRHX, resulting in a NRHX RWCL outlet temperature exceeding 140 degrees farenheit.
- (b). A menual initiation of Standby Liquid Control System.
- (c). A loss of all AC power, concurrent with a LO-LO reactor water level.

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

QUESTION 2.10 (2.00)

The RWCU system reject flow rate is controlled by FCV-F033. LIST TWO (2) conditions that will automatically shot the FCV-F033 valve and DESCRIBE what these conditions may indicate.

NOTE: SETPOINTS ARE REQUIRED

QUESTION 2.11 (2.00)

DESCRIBE the methods required to reset the RCIC turbine Trip and Throttle valve after:

(a), a mechanical trip.

(1.0)

(b). an electrical trip.

(1.0)

NOTE: ANSWER SHOULD INCLUDE ALL AREAS WHERE THIS CAN BE ACCOMPLISHED

QUESTION 2.12 (1.00)

The Reactor Recirculation pump seal cartridge assemblies consist of two sets of sealing surfaces and breakdown bushing assemblies. Failure of the # 1 seal assembly at rated conditions would result in ... (CHOOSE ONE).

- (a). ... a decrease in \$ 1 seal cavity pressure from approximately 1000 psig to approximately 500 psig.
 - (b). ... an increase in \$ 1 seal cavity pressure from approximately 500 psig to approximately 1000 psig.
 - (c). I.. an increase in # 2 seal cavity pressure from approximately 500 psig to approximately 1000 psig.
 - (d). ... a decrease in # 2 seal cavity pressure from approximately 500 psig to approximately 0 psig.

QUESTION 2.13 (2.00)

LIST 2 design bases of the Rod Sequence Contol system.

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

QUESTION 2.14 (2.00

The APRM scram function actually consists of two separate setpoints:

a. FILL IN THE BLANKS!

| Flow Biased Scram | - 711 W W | 4 173 4 | |
|-------------------|-----------|-------------------------|--|
| | | mer enn har har har har | |

b. LIST the specific location(s) of the sensor(s) which measure the variable "w".
(0.5)

c. While operating at power, one MSIV fails shot resulting in a brief (" 1 second) flux spike to 121% power. STATE which of the two scram setpoints mentioned above (one or both) should initiate a reactor scram. JUSTIFY your choice. (1.0)

QUESTION 2.15 (2.00)

For each of the following situations (i and i) select the correct Feedwater Control System / plant response from the list (a through e) which follows. An answer may be used more than or ie, and NO operator actions are taken.

- (a). Reactor water level decreases and stabilizes at a lower level.
- (b). Reactor water level decreases and initiates a reactor scram.
- (c). Reactor water level increases and stabilizes at a higher level.
- (d). Reartor water level increases and initiates a turbica thin
- (e). None of the above
- i. The plant is operating at 70% power, in 3-element control, when one of the Steam Flow Detectors FAILS DOWNSCALE.
- ii. The plant is operating at 90% power, in 3-element control, when HPCI inadvertently initiates and injects.

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

QUESTION 2.16

(2.00)

As the Instrument and Service Air header pressure; DECREASE below normal, certain automatic actions and alarms occur. MATCH the pressures listed with the applicable automatic action or alarm.

AIR WEADER PRESSURE

| | | 4 | | | | |
|--|--|---|--|--|--|--|
| | | | | | | |
| | | | | | | |

b. 105 psig

c. 100 psig

d. 95 psig

ACTION/ALARM

- 1. 'INST AIR PRESS LOW' Alarm
- 2. Standby Rx Eldg Air Compressors START
- 3. Interruptable Instr Air Hdr Isolation
- 4. "SERVICE AIR PRESSURE LOW" Alarm
- 5. Scram Air Hdr Isolation
- 6. Service Air Hdr Isolation
- 7. ACC Air System transfers to Nitrogen

QUESTION 2.17

(.50

CONCERNING the MPCI Turbine: TRUE or FALSE

With the exception of the HPCI Turbine Exhaust Diaphram Pressure High: an automatic isolation signal seals in both A and B logic buses and must be manually reset by the operator by depressing the AUTO ISOLATION SIGNAL A AND B reset buttons on the RTGB.

 2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS

PAGE

ANSWERS -- BRUNSWICK 182

-86/10/21-FROCKMAN, K.

ANSWER 2.01 (2.00)

The piping in question is that between the reactor vessel penetration (SBLC Inlet) and the shroud (0.5). Pressure is sensed above the core plate (0.25) and at the spray sparger (0.25). The indication is normally a negative dp (0.25); when a break occurs, the dp will go positive (0.25). If a break occured in the monitored area, full spray flow would NOT be available for core cooling (0.5).

REFERENCE BSEP HO-14-2/3-E p.9

ANSWER 2.02 (1.50)

a. 3 seconds; 5 seconds (0.25each)

b. The three (3) second minimum is to limit the pressure/flow transient on the reactor. (0.5)

The five (5) second maximum is to limit the loss of coolant inventory and reduce the amount of radioactivity released to the environment. (0.5)

REFERENCE BSEP HO-17-2/3-A p. 6

ANSHER 2.03 (1.25)

- 1. LLZ (Low Low Reactor Water Level)
- 2. Main Steam Line high radiation

(5 @ 0.25 each)

- 3. Main Steam Line high flow
- 4. Reactor Blds. Main Steam Line tunnel high temperature.
- 5. Turbine Bldg. Main Steam Line tunnel high temperature.
- 5. Low condenser vacuum
- 7. Low Steam Line pressure

2, PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEM

PAGE

ANSWERS -- SRUNSWICK 182

-86/10/21-BROCKMAN+ K.

REFERENCE BSEP H0-17-2/3-A pp. 9:10

ANSKER 2.04 (2.00)

1. Reactor Low water level, LL#3 (2.5') (0.5)

2. Reactor Low water level: LL#1 (162.5°) (0.5

 Operation of both pumps of one LFCI loop or Core Spray pump as (0.5) indicated by a pump discharge pressure of 100 psig.

4. Time delay of 105 seconds has elapsed. (0.5)

REFERENCE

ANSWER 2.05 (1.00)

Faster opening time for the Scram Outlet valve (CV-127) ensures that (0.5) there will be no rod binding or excessive hydraulic forces on the control rod during insertion.

Scram Dutlet valve (CV-127) has a stronger spring and shorter run of (0.5) air piping, giving rise to a faster air pressure bleed off time.

REFERENCE BSEP HO-28-2/3-A pp. 7.8

ANSWER 2.06 (1.00)

- 1. The bibing is kept full to verify system integrity.
- 2. The piping is kept full to minimize the potential problems associated with water hammer in the piping.
- 2. In a full condition the speed at which the flow reaches the reactor vessel is fastest. (2 0 0.5 each)

REFERENCE BSEP H0-14-2/3-B bp.30+3:

2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS

ANSWERS -- BRUNSWICK 182

-86/10/21-BROCKMAN. K.

ANSWER 2.07 (1.00)

| | 1E | | 0. | |
|-----|----|--|----|-----|
| | | | 0. | 25) |
| 1.6 | | | | |
| | | | | |

REFERENCE BSEP HO-14-2/3-0 p.14

ANSHER 2.08 (1.00)

A (1.0)

REFERENCE BSEP H0-14-2/3-H p.14

ANSWER 2:09 (1:50)

(b). F001 stays open, F004 closes (0.5)

(c). F001 stays open: F004 closes (0.5)

REFERENCE

BSEP 40-11-2/3-A pp. 9:13:14

ANSHERS -- BRL SWICK 182

-86/10/21-BROCKMAN, K.

ANSWER 2.10 (2.00)

(a). Low pressure isolation: 5 psig + or - 3 psig (0.5)

This indicates a break in the system process line (ensures that the RWCU system does not go into a vacuum like the Main Condenser) - OR - may indicate that no discharge path exists (Both main condenser and radwaste isolation valves

This may indicate a failure of the breakdown orfice (and is (0.5)

REFERENCE BSEP HO-11-2/3-A p.15

ANSWER 2.11 (2.00)

- (a). The Turbine Trip and Throttle valve (T&T) has to be nanually (1.0) reset LOCALLY by declutching the motor and operating the hand valve wheel to the "FULLY CLOSED" position and then to the "FULLY OPEN" position. (Prevented from remote opening of the valve)
- (b). The T&T valve can be reopened remotely by means of the motor (1.0) actuator. The motor actuator is controlled manually through the control switch(E51-S26). The motor is first run to the valve 'CLOSE' position then to the valve 'OPEN position where trip latch is reset and the turbine is completely ready to operate. (Can be done remotely from RTGB in the control room or from RS-4 (Remote Shutdown Panel) in the Reactor Sldg..)

REFERENCE BSER HD-14-2/3-C pp. 35/36

ANSWER 2.12 (1.00)

(4)

BSEP HO-10-2/3-A Figure 5, p.79

ANSWERS -- BRUNSWICK 182

-83/10/21-BROCKMAN, K

ANSKER 2.13 (2.00)

- (1). Restrain rod motion such that a postulated rod drop accident will not result in a peak fuel enthalpies greater than the design limit of 280 cal/gram for the entire range of plant operations and core exposures.
- (2). Prevent the reactor operator from moving an out of sequence control rod in the 100% to 50% rod density range.
- (3). Allow, from the 50% rod density point to the 30% power level, 9NLY group notch mode rod withdrawals or insertions.

(2 @ 1.0 each)

REFERENCE BSEP HO-27-2/3-C p.1

ANSWER 2.14 (2.00)

a. .66 % w + 54% 120% (0.2

b. Recirc Loop flow elements (pump discharge)

c. Only the 120% fixed scram (0.5) This is because the flow biased scram incorporates a time delay into its actuation (" & seconds, representative of the fuel temperature transient time) (0.5) (1.0)

REFERENCE BSEP1 SSM 25-2/3-D

ANSWER 2.15 (2.00)

i. a (1

SENET LP#17.P. 74:TRANSTENT #20:01-57.P.53

EIH: L-R0-726 BSEP: RIN 026 2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS

WSWERS -- BRUNSWICK 182 -86/10/21-BROCKMAN, R

ANSWER 2.16 (2.00)

a. 4

6. 6

c. 3 (0.25) & 1 (0.25)

d. 2

(0.5 each)

REFERENCE

BSER: HO-21-2-A; 15-2/3-6, Rev 1; AOP 20.0

ANSWER 2.17 (.50

True (0.5)

REFERENCE 98EP HQ-14-2/3-9 pp. 22-23

| QUESTION | | |
|----------|------|------------|
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