U. S. NUCLEAR REGULATORY COMMISSION REGION I
OPERATOR LICENSING EXAMINATION REPORT

EXAMINATION REPORT NO. 84-14

FACILITY DOCKET NO. 50-443

FACILITY CONSTRUCTION PERMIT NO. CPPR-135

LICENSEE: Public Service Company of New Hampshire
P. O. Box 330
Manchester, New Hampshire 03105

FACILITY: Seabrook Unit 1

EXAMINATION DATES: September 17 - 21, 1984

CHIEF EXAMINER: D. Johnson — 11/11/84
D. Johnson
Lead Reactor Engineer (Examiner)
Date

APPROVED BY: John Keery for — 11/13/84
R. Keller
Chief, Project Section 1D
Date

SUMMARY: Written, oral and simulator examinations were administered to eleven SRO and two RO candidates. One SRO candidate failed the written examination and one RO candidate failed the simulator examination, and therefore both failed to qualify for a license.

REPORT DETAILS

TYPE OF EXAMS: Initial __X__ Replacement _____ Requalification _____

EXAM RESULTS:

	RO Pass/Fail	SRO Pass/Fail	Inst. Cert Pass/Fail	Fuel Handler Pass/Fail
Written Exam	2 /0	10/1	0/0	0/0
Oral Exam	2/0	11/0	0/0	0/0
Simulator Exam	1/1	11/0	0/0	0/0
Overall	1/1	10/1	0/0	0/0

1. CHIEF EXAMINER AT SITE: D. Johnson, NRC

2. OTHER EXAMINERS: J. Fehringer, EG&G
R. Sailor, EG&G
R. Picker, EG&G
P. Isaksen, EG&G

3. PERSONS EXAMINED

RO

J. Lavoie
N. Pond

SRO

J. Comiotes
W. Di Profio
J. Grillo
E. Madej
P. McCabe
R. O'Connor
J. Peterson
P. Richardson
M. Shannon
G. St. Pierre
R. Thompson

4. Comments on interface effectiveness with plant training staff and plant operations staff during exam period.

Console instructors responded immediately to requests for assistance from outside operators, such as Health Physics, I&C, auxiliary operator, etc. This creates an unrealistic atmosphere for combating unusual events. In the real world it would take time to locate personnel and take the proper actions, which could cause degradation of conditions.

The existing simulator area creates an artificial environment in that the instructors are not separated from the operators, ie. candidates communicate directly with instructors and have constant eye contact when on the phone waiting a required response. This type of communication would not exist in an actual incident and therefore does not test fully the decision making ability of the operators.

5. Deficiencies noted during simulator exam and plant walk through.

1) Process and area radiation monitoring not available (essential in determining cause, location and actions required during a LOCA).
2) Remote shutdown panel indication for pressurizer pressure is a narrow range instrument (not very useful for controlling a plant cooldown).
3) Simulator model for a LOCA while in cold shutdown and inadvertent SI does not represent actual parameter behavior, ie. containment pressure immediately goes to 15#, sump level is 0 while PRT temperature is off scale. Level remains normal while pressure equalizes with containment, etc.

6. Examination Review.

At the conclusion of the written examination, the examiners met with the following licensee personnel to review the exam and answer keys to identify any inappropriate questions relative to plant specific design and to ensure that the questions will elicit the answers in the key and that they reflect the most current plant conditions.

PSNH

R. Hickok
J. Nichols
D. Schreiner
S. Simonson

Comments and Resolutions

Questions 1.02b and 5.02b

According to the references provided by the licensee and used in the operator training programs in the areas of heat transfer and fluid flow, the effective heat transfer coefficient is not a maximum at DNB because the heat transfer process has already begun to degrade.

> "A maximum flux is attained when the bubbles become so dense that they coalesce and form a vapor film over the heated surface. The heat must then pass through the vapor film by a combined mechanism of conduction and radiation neither of which is particularly effective in this temperature range..." "The maximum flux, which is a design limitation, is referred to as the DNB value."
>
> An additional reference describes the heat transfer coefficient as representative of the slope of the boiling curve. Since the slope of the curve descreases before the point of DNB, the heat transfer coefficient is not maximum at DNB.
>
> "In region II, where nucleate boiling takes place, the heat transfer is improved, since the formation and detachment of bubbles from the surface causes increased turbulence, which more effectively mixes the hot fluid at the wall surface with the cooler bulk of the fluid. The larger heat transfer coefficient that results is indicated by the steeper slope of the boiling curve in region II."

Finally, the Westinghouse Training Center at Zion, Illinois has recently modified Chapter 13 of their fundamentals text book regarding boiling heat transfer due to its misleading nature.

Based upon review of the above references the answer key was changed to reflect "False" as being the correct answer to Questions 1.02b and 5.02b.

Questions 1.02c and 5.02c

According to the references provided by the license and used during the license training, the heat transfer rate increases as pressure increases with a constant temperature difference $(T_{wall} - T_{sat})$ in the nucleate boiling regions. On a pool boiling curve this is indicated by the curve shifting vertically. This is difficult to explain theoretically, however empirical data supports this premise.

The Jens-Lottes correlation accurately predicts the relationship between the heat transfer coefficient and pressure with a constant temperature difference using the following equation:

$$(T_{wall} - T_{sat}) = 60e^{-P/900}(q''/10^6)^{1/4}$$

where: P = pressure
q" = heat transfer coefficient

Experimental data for water boiling on a platinum wire also indicates an increase in the heat transfer rate for an increase in pressure with a constant temperature difference.

In terms of what happens to CHF (the point of DNB) as pressure is increased refer to the safety limit curve given in Technical Specifications. The right hand segments of the safety limits move upward as system pressure is increased. Since this segment is based upon a DNBR of 1.30, it means that for any given constant point of Tavg vs. Reactor Power (heat flux), if pressure is increased, that point is representative of a large DNBR. Since heat flux is being kept constant, CHF increases to give a larger DNBR at increased pressure.

Based upon review of the above references the answer key was changed to reflect "False" as being the correct answer to Questions 1.02c and 5.02c.

Question 2.03a

The CCP (centrifugal charging pump) mini flow lines have been re-designed. This could result in two answers to this question.

1) The manual isolation valves CS-V-198 and CS-V-212 have been removed.

2) The motor operated valves CS-V-196 and CS-V-197 have been moved. These valves are now in same locations as CS-V-198 and CS-V-212 were before the design change.

Based on review of the current P&ID's and the design modification, either set of values will be accepted as a correct answer.

Question 3.06b

The pressurizer level flexible bellows has been deleted and replaced with a standard condensate pot. Based on review of the design change, this question was deleted to avoid confusion.

Question 3.08a

The reference material showing C-9 vacuum input being 3/3 (system handout) is incorrect. The functional diagram which is the basis for the handout shows C-9 vacuum input as being 2/3.

The answer key was changed to reflect the correct answer of 2/3 logic.

Question 8.09

The information requested relates to the construction fire protection procedure rather than the station fire protection procedure. The phone numbers to notify construction are normally posted on the phones in the plant and stickers inside hard hats and are not normally memorized.

During training, we taught the station fire protection procedure OS1200.00 that will be in effect at fuel load.

Based upon review of the above procedures, answers from either procedure will be acceptable.

Question 8.06

The basis for this question, Standing Operating Order No.83-012, was cancelled and superseded by Standing Operating Order No. 84-003 which is being taught in the current training program.

Because the question will not elecit the correct answer this question was deleted.

7. Personnel Present at Exit Interview.

NRC Personnel

D. Johnson, Chief Examiner
L. Wiens, Auditor
A. Cerne, Senior Resident Inspector

NRC Contractor Personnel

J. Fehringer, EG&G Idaho
R. Sailor, EG&G Idaho

Facility Personnel

D. Moody, Station Manager
L. Walsh, Operations Manager
P. Swanson, Training Center Manager
R. Hickok, Instructional Coordinator

8. Summary of NRC Comments made at exit interview.

   The licensee was informed that of thirteen candidates examined, four were considered marginal and not clear passes at this time and that further evaluation would be necessary to determine their final status. Deficiencies noted during plant walk through and simulator exams were discussed.

9. Summary of facility comments and commitments made at exit interview.

   Licensee will provide updated material prior to next set of exams scheduled for December, 1984 including simulator IC's and Cause and Effect Document.

Attachments:

1. Written Examination(s) and Answer Key(s) (SRO/RO)
2. Facility Comments on Written Examinations made after Exam Review