CP&L
Carolina Power & Light Company

MAY 10 1982

Office of Nuclear Reactor Regulation
ATTN: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
SUPPLEMENTAL INFORMATION -
TMI ITEMS I.A.2.1 & II.B.4

Dear Mr. Vassallo:

Background

By your letter dated April 2, 1982, NRC requested Carolina Power & Light Company (CP&L) to provide additional information regarding our July 28, 1980 submittal on Immediate Upgrading of Reactor Operator and Senior Reactor Operator Training and Qualifications (NUREG-0737, Item I.A.2.1) and Training for Mitigating Core Damage (NUREG-0737, Item II.B.4).

The enclosure to this letter is in response to your April 2, request.

Discussion

During the review of the NRC Request for Additional Information, my staff noted the requirement for a "minimum of 80 contact hours of training for mitigating core damage" (un-numbered question, page 3 and question 3, page 2). Further review of NUREGs-0660 and 0737 and H. R. Denton's guidance letter of March 28, 1980, indicated no guidance for a minimum of 80 contact hours in mitigation of core damage.

CP&L contacted the NRC regarding the aforementioned guidance. NRC advised CP&L that NRC's technical consultant misinterpreted NRC's intent of the "minimum requirement". NRC's intent was that a licensee's training program would very likely be acceptable if a minimum of 80 contact hours were provided that related to mitigating core damage (i.e. including training on related systems, heat transfer, fluid flow and thermodynamics).

Enclosed please find a discussion of the Brunswick Steam Electric Plant Unit Nos. 1 and 2 (BSEP) training program for reactor operators and senior reactor operators. The BSEP training program meets or exceeds that required by NRC as referenced in H. R. Denton's letter of March 28, 1980.

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Please contact our staff should you have any questions regarding the enclosed information.

Yours very truly,

P. W. Howe
Vice President
Technical Services

MSG/lr (n-38)
Enclosure

cc: Mr. R. T. Liner
(Science Applications, Inc.)
Mr. J. P. O'Reilly (NRC-RII)
Mr. J. Van Vliet (NRC)

ENCLOSURE

CAROLINA POWER & LIGHT COMPANY'S (CP&L) RESPONSE
TO UPGRADED SRO AND RO TRAINING AND TRAINING FOR
MITIGATING CORE DAMAGE - NRC REQUEST FOR
ADDITIONAL INFORMATION (APRIL 2, 1982)

NRC Question 1

Does the training program have an increased emphasis on reactor and plant transients as called for in enclosure 1 of Denton's March 28, 1980 letter? Does this training deal with both normal transients and abnormal (accident) transients?

CP&L Response

Yes. The Lesson Plan for Plant Transients has been updated and our classroom lecture teaches all FSAR analyzed transients. These transients deal with both normal and abnormal transients including Design Basis Accidents. The program is updated after each core reload, based on supplemental reload licensing information supplied by the vendor. This training includes four days at the Limerick Simulator and transients are covered in detail.

NRC Question 2

Are the lectures and quizzes on the subject of accident mitigation given to shift technical advisors and operating personnel from plant manager through the operations chain to the licensed operators? If they are, would you please provide the titles of the people who are trained and an organization chart which illustrates their position in the operations chain?

CP&L's Response

Lectures and tests regarding Accident Mitigation have been given to the following:

* a) Shift Technical Advisors
* b) Shift Operating Supervisors
* c) Shift Foremen
* d) Senior Control Operators
* e) Reactor Operators
* f) All licensed non-operations personnel
* g) Manager - Operations

t** h) Manager - Plant Operations

t i) Manager - Maintenance

t j) Manager - Environmental & Radiation Control

t** k) General Manager

* Tests were included in the final retraining exam.

** Missed one lecture (to be completed by June 15, 1982).

t Test not given.

Figure 1 indicates management positions in the operating chain that received the training.

NRC Question 3

Do the training and requalification program elements which involve heat transfer, fluid flow, thermodynamics and accident mitigation involve 80 contact hours? (A contact hour of instruction is a one-hour period in which the course instructor is present or available for instructing or assisting students; lectures, seminars, discussions, problem-solving sessions, and examinations are considered contact periods under this definition.)

CP&L Response

Previous Training

All licensed operators at the Brunswick Plant have received the following training which contained a minimum of 80 contact hours in the areas of Heat Transfer, Fluid Flow, Thermodynamics and Accident Mitigation. The training was broken down as follows:

a)	Accident Mitigation with Core Damage	= 24 hours
b)	Emergency Plan Training	= 8 hours
c)	Simulator total retraining course of 32 hours, of which 16 hours are dedicated to Transients and Accident Mitigation	= 16 hours
d)	Heat Transfer, Fluid Flow and Thermodynamics	= 40 hours
	TOTAL	= 88 hours

Current Training

a) Beginning in January, 1982, the initial classroom training (for subjects related to Accident Mitigation with Core Damage) for RO candidates and SRO candidates is as follows:

40 hours of Heat Transfer, Fluid Flow and Thermodynamics
40 hours of ECCS Training
16 hours of Emergency Plan Training
8 hours of Transients, both abnormal and "normal"
4 hours of DBA instruction
4 hours of Accident Mitigation with Core Damage (AMWCD)*

b) Beginning in January, 1982, the annual operator retraining program (for subjects related to AMWCD) is as follows. A shorter period of time is allotted to Heat Transfer, Fluid Flow and Thermodynamics as well as transient responses and AMWCD. An approximate time breakdown is as follows:

24 hours - Heat Transfer, Fluid Flow and Thermodynamics
24 hours - ECCS
4 hours - Transients and DBA
8 hours - Emergency Plan Training
4 hours - AMWCD

In addition, CP&L presently sends all licensed operators to the simulator for 32 hours of training of which approximately 16 hours is allotted to AMWCD and its methods of prevention. Of the total 120 classroom hours allotted to annual retraining (TI-200), 53% of these hours (those listed above) address Heat Transfer, Thermodynamics, Fluid Flow, ECCS, Emergency Plan Training, Transients and AMWCD.

c) In reference to the RO candidates' simulator time (80 hours), most of this time is spent in preparation for simulator certification from both the vendor and the NRC examiners. However, during this period of 80 hours (40 hours classroom, and 40 hours simulator) a review of Heat Transfer, Fluid Flow, Thermodynamics, AMWCD, Transients and plant responses takes place.

d) The SRO candidates receive 56 hours of simulator time prior to NRC simulator examinations. During this period, they are under constant training to evaluate plant responses during Transients, Accidents and other "abnormal" conditions including AMWCD.

*The core mitigation is a continuous topic during the 40 hours of ECCS instruction. The 4 hours allotted to AMWCD is a "summary class" to allow the student to incorporate the previous training concerning ECCS, Transients and DBA instruction with AMWCD.

NRC Question 4

Do your instructors enroll in appropriate requalification programs to assure they are cognizant of current operating history, problems, and changes to procedures and administrative limitations?

CP&L Response

All Brunswick licensed operator instructors participate fully in the retraining program (TI-200, page A-4, paragraph 1). The instructors are taught by an instructor who has received General Electric (GE) training.

NRC Question (unnumbered question from page 3)

For item II.B.4 provide an outline of the training program for mitigating core damage, including the number of training hours involved. Your outline can include any training program which relates to the training for mitigating core damage. Follow the guidelines given in enclosure 3 of H. R. Denton's letter dated March 28, 1980 and INPO Guidelines for Training to Recognize and Mitigate the Consequences of Core Damage (Document Number STG-01, Rev. 1, January 15, 1981). NRC requires a minimum of 80 contact hours of training for mitigating core damage.

CP&L Response

Following is an OUTLINE and a PRESENTATION for our "Mitigating Core Damage" training. This information shows 25 training hours while Item (a) under Previous Training in the response to NRC Question 3, shows 24 hours for AMWCD. This small discrepancy is because minor portions of the Mitigating Core Damage training were already a part of existing training and therefore, there is a slight overlap of some subjects (for example: introductory information on instrumentation).

The training described below is not conducted as an independent module or modules. Rather, it is incorporated into all of the Current Training described in the response to NRC Question 3.

MITIGATING CORE DAMAGE

OUTLINE

Response to Item II.B.4

I. Introduction

- A. Denton Letter (March 28, 1980)
  - 1. Brief Discussion
- B. Three Mile Island
  - 1. Review Sequence of Events - up to page 326
- C. ECCS
  - 1. Review Logic
  - 2. Capacity
  - 3. Break Size
  - 4. Decay Heat

II. Mitigating Core Damage

- A. Sources of Water
- B. Pump Curves
  - 1. Curves Developed by Vendor - Not Valid Under All Conditions
  - 2. Human Engineering Factors
- C. RTD's
  - 1. Theory
  - 2. Use
  - 3. Extended Range
- D. Thermocouples
  - 1. Theory
  - 2. Use
  - 3. Extended Range
- E. Pressure Instruments
  - 1. Theory
  - 2. Use
- F. Level Instruments
  - 1. Type
  - 2. Range
  - 3. Compensated Reference Leg
  - 4. "Cold Reference Leg"
  - 5. Effect of High Drywell Temperature on Level Instruments
- G. SRM Detectors
  - 1. Use of Detectors to Determine Water Level
- H. S/RV Tailpipe Temperature
  - 1. Use to Determine Water Level
  - 2. Reliability
- I. Blowdown Period
  - 1. Shrink and Swell
- J. Refill Period
  - 1. Discussion
- K. Natural Circulation
  - 1. Operator Control
  - 2. Normal and Internal Natural Circulation

L. Hydrogen/Gas Generation
    1. Material in FSAR
    2. Data from Owners' Group
    3. New Material from GE
M. Post Accident Sampling
    1. Review Sources of Radioactivity in a BWR
    2. Present Sampling Capability
    3. New Sample Sink
    4. RC&T Sample Procedure
N. Radiation
    1. Review of Possible Radiation Sources
    2. Exposure Areas
    3. FSAR Material
    4. Radiation Instrumentation
O. Degraded Core Corrosion Effects
    1. Chemistry
    2. Discuss Material from GE

MITIGATING CORE DAMAGE

PRESENTATION

I. Introduction

A. Denton Letter (March 28, 1980) - 30 minutes

1. Brief discussion of letter

2. Use Enclosure 3 as reference to discuss topics addressed.
   a. Students receive a copy of Enclosure 3.

B. Three Mile Island - 2 hours

1. Review student handout (Reference of Events up to Page 326 of NRC Report Volume I). Relate Denton letter to sequence of events. Generate class discussion.

2. Using B&W Plant Preliminary System's Manual, relate the NRC TMI sequence of events to B&W systems. Point out similarities between BWR and PWR systems.

3. Stress operator action toward alarms and temperature indications (that appeared to have been ignored). Stress trends.

   a. Superheat not recognized by operator. Review superheat and discuss recognition in BWR vessel.

4. Discuss why nuclear instruments (SRMs) increased and decreased at various times during the accident.

5. Discuss use of expanded readings using RTDs

C. ECCS - 1 1/2 hours

1. Review Logic
   a. Student handout - Review logic of ECCS from normal plant conditions to a LOCA condition with and without off-site power (diesels available). Also review logic with high drywell pressure.

2. Capacity
   a. Review capacity of water storage tanks (reference BSEP tank curves; these show tank level vs. gallons).

3. Break Size
   a. Review pipe break size in relation to ECCS capacity (reference FSAR Volume II and Technical Specifications for Unit I and II).

4. Decay Heat
   a. Review amount of heat generated as decay heat (and length of time it will be generated).

II. Mitigating Core Damage (Student handout - reference various owners' group letters)

A. Sources of Water (partly from handout) - 45 minutes

1. Capacity of storage tanks. Which tanks are preferred for water injection into vessel.

2. Capacity of torus

3. Alternate sources of water

4. Sea water (river) injection

B. Pump Curves (in handout) - 45 minutes

1. Review pump curves for HPCI, RCIC, LPCI Mode of RHR, Core Spray, Condensate and Condensate Booster pumps.

2. Review data presented on curves and how curves are developed.

3. Note to students that curves are not for the pump installed in system but are developed in vendor's test facility.

4. Discuss operator response to these curves. Discuss possibility of reading error due to lack of familiarity.

C. RTD's (in handout) - 45 minutes

1. Theory of operation (Reference Nuclear Power Instrumentation Systems Handbook and GEK Volume X)

2. RTD use and advantages of use.

3. Extending the range of RTD's.

D. Thermocouples (in handout) - 45 minutes

1. Theory of thermocouple operation

2. Thermocouple use and advantages of use.

3. Extending thermocouple range (basic concepts).

E. Pressure Instruments (in handout) - 30 minutes

1. Theory of operation (Volume X GEK).

2. Temperature/Pressure relationship in a saturated system.

F. Level Instruments (in handout - additional handout given on all level instruments) - 8 hours

1. Types of level instruments that operator has available in control room, and types that will initiate ECCS.

2. Range of each instrument. Also, where variable and reference leg vessel taps are located.

3. Compensated Reference Leg - Discuss which level instruments have this design, the temperature of the legs under normal conditions.

4. Cold Leg Instruments - The level instruments having this design, and temperature under normal conditions.

5. Effect of High Drywell Temperature on all Level Instruments
   a. advantage of "cold leg"
   b. possibility of level error
   c. work problem showing water level response for a reference leg temperature rise from 135°F to 300°F.

G. SRM Detectors - 30 minutes

1. Possible use of SRM for determining water level (reference Owners' Group letter).

2. Reliability of indication.

H. S/RV Tailpipe Temperature - 30 minutes

1. Review type of thermocouple used.

2. Use of Tailpipe Temperature to indicate reactor vessel full of water (reference Owners' Group letter).

I. Blowdown Period - 30 minutes

1. Discuss shrink and swell of water during this phase (reference to Volume II FSAR).

J. Refill Period - 30 minutes

1. Discuss core cooling (steam cooling) during refill period - (reference Volume II FSAR).

K. Natural Circulation - 1 hour

1. Inherent characteristics of a BWR (reference NEDO-24708).

2. Natural circulation as it relates to water level - Normal and Internal.

L. Hydrogen/Gas Generation - 2 hours

1. Present material in FSAR (Volume II).

2. Present data generated by Owners' Group letter

3. Present data from GE (information was not available until June, 1981).

M. Post Accident Sampling - 2 hours

1. Review sources of radioactivity in a BWR (reference NEDO-24810).

2. Present sampling capability
   a. RC&T procedure 1500

3. Review new sample sink
   a. Reference - TMI group and NEDO-24889

4. RC&T Sample Procedure
   a. How exposure to RC&T is minimized

N. Radiation - 2 hours

1. Sources of radiation in the event of an accident

2. Amount of exposure in key areas (Reference NEDO-24810)

3. Discuss applicable portions of FSAR Volume II

4. Radiation instrumentation planned for BSEP (post-TMI).

O. Degraded Core Corrosion Effects - 30 minutes

1. Review BSEP chemistry handout.

2. Review available information from GE.

SUMMARY

The BSEP training program complies with or exceeds the criteria as set forth in 10CFR55 and NUREG-0737 (Item Nos. I.A.2.1 and II.B.4).

As previously discussed in the transmittal letter to this enclosure, 80 contact hours is not a minimum requirement of training for mitigating core damage. But rather, the total training curriculum should be acceptable if at least 80 contact hours are provided that relate to mitigation of core damage.

NRC Inspection Report Nos. 50-324/82-05 and 50-325/82-05 (January 15 - February 15, 1982) states, "The inspector verified that the licensee had modified the reactor operator (and SRO) training programs to include training in heat transfer, thermodynamics, accident mitigation and the use of plant systems if core damage occurs, and has increased the emphasis on transients. Certain individual operator training records were reviewed to verify completion of the above training; no discrepancies were identified. This item and item II.B.4, Training for Mitigating Core Damage, are closed."

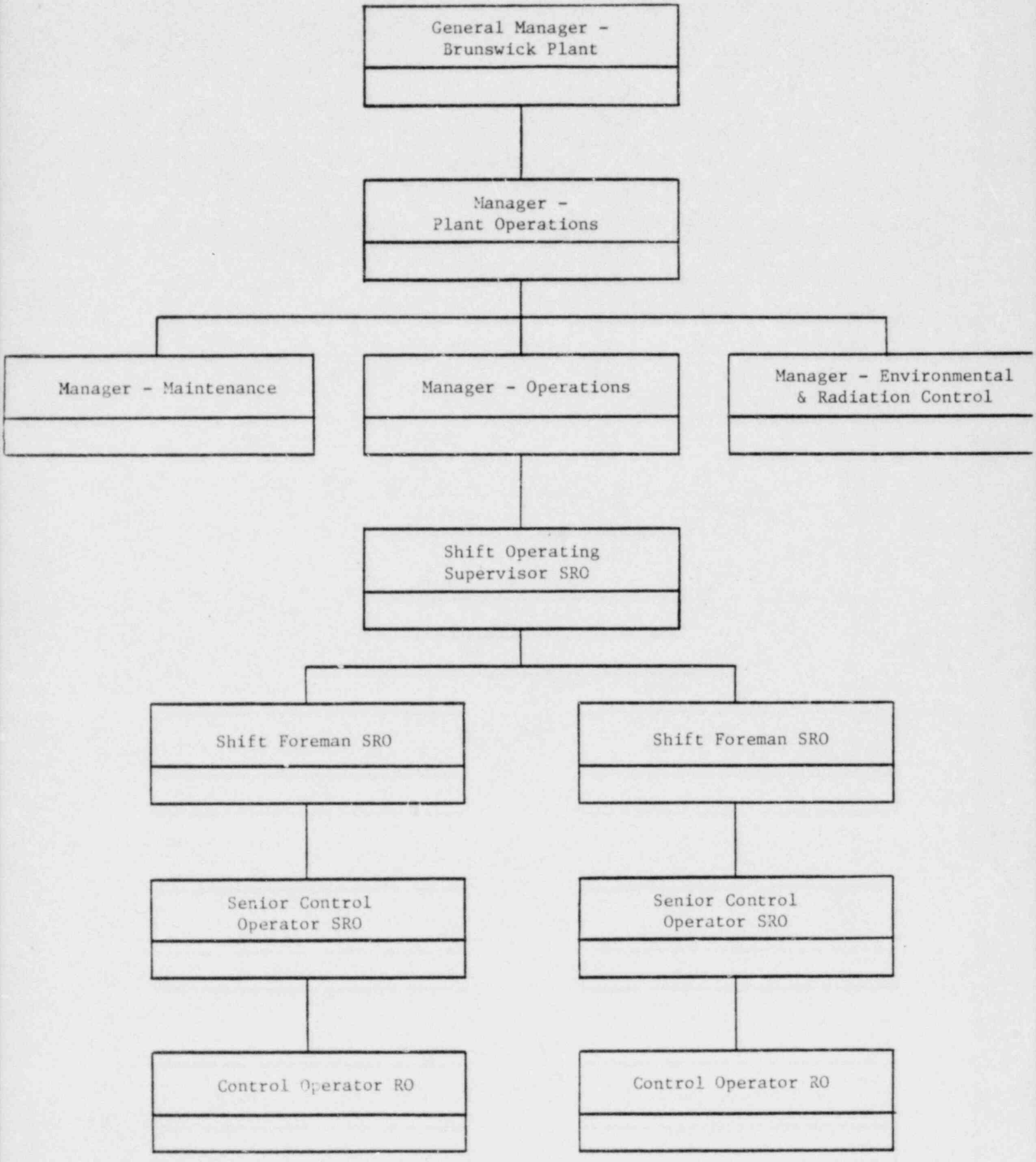
General Manager -
Brunswick Plant
Manager -
Plant Operations
Manager - Maintenance
Manager - Operations
Manager - Environmental
& Radiation Control
Shift Operating
Supervisor SRO
Shift Foreman SRO
Shift Foreman SRO
Senior Control
Operator SRO
Senior Control
Operator SRO
Control Operator RO
Control Operator RO

Figure 1