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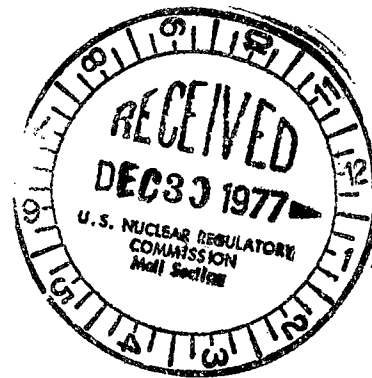
Public Service Electric and Gas Company 80 Park Place Newark, N.J. 07101 Phone 201/622-7000

Ref. LCR 77-12

December 21, 1977

Director of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Attention: Mr. George Lear, Chief  
Operating Reactors Branch #3  
Division of Operating Reactors



Gentlemen:

REQUEST FOR AMENDMENT  
FACILITY OPERATING LICENSE DPR-70  
UNIT NO. 1  
SALEM GENERATING STATION  
DOCKET NO. 50-272

In accordance with the Atomic Energy Act of 1954, as amended, and the regulations thereunder, we hereby transmit copies of our request for amendment to Facility Operating License DPR-70 for Salem Generating Station, Unit No. 1.

This request consists of proposed changes to the Environmental Technical Specifications (Appendix B).

This submittal includes three (3) signed originals and forty (40) copies.

Very truly yours,

Frank P. Librizzi  
General Manager -  
Electric Production

773120275

U. S. NUCLEAR REGULATORY COMMISSION  
DOCKET NO. 50-272


PUBLIC SERVICE ELECTRIC AND GAS COMPANY  
FACILITY OPERATING LICENSE NO. DPR-70  
NO. 1 UNIT  
SALEM NUCLEAR GENERATING STATION

Public Service Electric and Gas Company hereby submits proposed changes to Facility Operating License No. DPR-70 for Salem Nuclear Generating Station, Unit No. 1. This change request relates to Appendix B of the Operating License, Environmental Technical Specifications.

Respectfully submitted,

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

BY:

  
FREDERICK W. SCHNEIDER  
VICE PRESIDENT



ALEM NUCLEAR GENERATING STATION  
 ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
 SUMMARY OF PROPOSED CHANGES  
 (Second Set)

<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
1.1 (page 1.1-1, 1.1-2, and 1.1-5)	<u>DEFINITIONS</u>  Amperometric Titration Chlorine Demand Combined Chlorine Residual Total Chlorine Residual	Clarification to reflect latest terminology.
2.1.1.b (page 2.1-3) and 2.1-3a)	<u>MAXIMUM <math>\Delta T</math> ACROSS CON- DENSER DURING PUMP OUTAGE</u>	Recognition that a circulating water pump may be inoperable due to the failure of inter-related equipment.  Correction to System Description
2.1.3 (page 2.1-8)	<u>RATE OF CHANGE OF DISCHARGE TEMPERATURE</u>  Monitoring Requirement Bases	Time limitation on monitoring discharge temperature every 15 minutes.
2.2.1 (pages 2.2-1 through 2.2-3a)	<u>BIOCIDES</u>  Specification Monitoring Requirement Bases	Clarification of monitoring requirements to reflect simultaneous chlorination of three intakes.  Clarification to reflect latest terminology.  Correction to chlorine monitor accuracy and to erroneous ASTM references.

SALEM NUCLEAR GENERATING STATION  
ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
SUMMARY OF PROPOSED CHANGES  
(Second Set)

<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
2.2.2 (page 2.2-4 and 2.2-4a)	<u>SUSPENDED SOLIDS</u> Monitoring Requirement Bases	Program assessment and potential reduction after one year.
Table 2.3-1 (Pg. 2.3-20)	<u>RADIOACTIVE LIQUID</u> <u>SAMPLING ANALYSIS</u>	Additional footnote "g" to clarify the fact that even though the two waste hold- up tanks are not designated monitoring tanks, they can be and will be sampled and monitored in accordance with the type of analysis and sampling frequency specified on this table. Increased operating efficiency and flexibility without affect- ing design objectives or safety margins. This path- way identical to all other liquid radwaste discharges in that it contains contin- uous radiation flow monitor- ing, automatic isolation, flow monitoring and contin- uous recording.
Table 2.3-3 (Pg. 2.3-22)	<u>SYSTEM STATION LIQUID</u> <u>WASTE SYSTEM</u> <u>LOCATION OF PROCESS AND</u> <u>EFFLUENT MONITORS AND</u> <u>SAMPLERS REQUIRED BY</u> <u>TECHNICAL SPECIFICATIONS</u>	Changes as indicated to clarify that, although the waste hold-up tanks are not technically designated monitoring tanks, they will receive the same sampling and monitoring prior to release as other tanks containing liquid radwastes.

SALEM NUCLEAR GENERATING STATION  
 ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
 SUMMARY OF PROPOSED CHANGES  
 (Second Set)

<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
Table 2.3-4 (Page 2.3-23)	<u>LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS</u>	Deletion of required radiation detector from condenser air removal system since it is not a final effluent release point into the environment.
Table 2.3-5 (page 2.3-24)	<u>GAMMA AND BETA DOSE FACTORS</u>	Revision of columns 4 and 5 to correct erroneous Table.
3.1.1.1 (page 3.1-1 and 3.1-1a)	<u>CHLORINE</u>  Objective Specification Bases	Specification of sample depths to coincide with balance of program.  Clarification to reflect latest terminology.  Program reduction to monthly field sampling due to continuous chlorine monitoring of the discharge to the fact that other abiotic field surveillance programs are on a monthly basis.
3.1.1.2 (page 3.1-2)	<u>DISSOLVED GASES</u>  Specification Reporting Requirement	Sample depth clarification.  Allowance for new EPA approved analytical methods for dissolved oxygen.

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 ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
 SUMMARY OF PROPOSED CHANGES  
 (Second Set)

<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
3.1.1.3 (page 3.1-3)	<u>SUSPENDED SOLIDS</u> Specification	Sample depth clarification.
3.1.1.4 (page 3.1-5)	<u>OTHER CHEMICALS</u>	Sample depth clarification.
3.1.2.1 (pages 3.1-10 and 3.1-10a)	<u>GENERAL ECOLOGICAL SURVEY</u> Specification (Phytoplankton)	Sampling frequency clarification.  Allowance for new EPA approved analytical methods for dissolved oxygen.
(page 3.1-10a)	Specification (Ichthyoplankton)	Clarification of sampling location.
(page 3.1-13 and 3.1-14)	Specification (Fish)	Sampling frequency clarification.  Changes in sampling gear to reflect technique appropriate to sampling area.  Limitation on sexing to anadromous species in spring due to difficulty with other species and at other seasons.  Elimination of weighing due to non-random sampling inherent in gill netting
(page 3.1-14 and 3.1-14a)	Specification (Diamondback Terrapin)	Sampling schedule clarification.

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 ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
 SUMMARY OF PROPOSED CHANGES  
 (Second Set)

<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
Table 3.1-1 (page 3.1-22)	<u>WATER QUALITY ANALYSIS PARAMETERS</u>	Revision to reflect latest EPA Storet terminology.  Elimination of "Reducing Substances" as a non-standard test, unnecessary to characterize Delaware River water quality.  Deletion of filtrable residue (dissolved solids) from list as required by ETS Section 3.1.1.3.
Table 3.1-2 (page 3.1-23)	<u>SUMMARY OF AQUATIC TERRESTRIAL, AND AERIAL SAMPLING PROGRAMS</u>	Corrections to reflect problems in gill netting north of Mile 6.5, to reflect the Diamondback  Terrapin which is not a mammal, and to conform with inclement weather provisions used elsewhere in the ETS.
4.1 (pages 4.1-1 and 4.1-2)	<u>EXPERIMENTAL ENTRAIN- MENT STUDIES</u> Specification	Revisions of experimental holding periods and water collection procedures to reflect standardization of experimental procedures.
(pages 4.1-2a and 4.1-3)	Specification	Correction of typographical error.



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ENVIRONMENTAL TECHNICAL SPECIFICATIONS  
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<u>SECTION</u>	<u>TITLE</u>	<u>REMARKS/JUSTIFICATION</u>
4.2.3 (pages 4.2-3 and 4.2-31)	<u>TEMPERATURE AND CHEMICAL AVOIDANCE STUDIES</u>	Clarification of analysis procedures.
5.1.1 (page 5.1-1)	<u>RESPONSIBILITY</u>	Changes to PSE&G internal organization.
5.2.1 (page 5.2-1)	<u>ORGANIZATION</u>	Changes to PSE&G internal organization.
Figs. 5.2-1 thru 5.2-2 (pages 5.2-2 thru 5.2-3)	<u>ORGANIZATION CHARTS</u>	Substitution of updated charts, including consolida- tion of two figures into one.

DEC:peg  
8/29/77

1. DEFINITIONS, ABBREVIATIONS AND NOTES

1.1 DEFINITIONS

1. AMBIENT TEMPERATURE

Temperature of the river unaffected by localized waste heat discharge; temperature of the river outside the designated mixing zone.

2. AMPEROMETRIC TITRATION

Specific adaptation of polarographic principles which are used to measure the total residual chlorine or to differentiate between the free available and combined chlorine residual.

3. CALIBRATION

Use of a known quantity of a measured parameter to determine the accuracy of the measuring instrument.

4. CHLORINE DEMAND

The amount of chlorine required to oxidize substances in the water which reduce free available chlorine.

5. COMBINED CHLORINE RESIDUAL

Residual consisting of mono-, di-, and trichloramines.

6. CONDENSER

Shall include the three condenser shells utilized in the Circulating Water System for each unit.

7. CONDENSER OUTLET TEMPERATURE

The average condenser outlet circulating water temperature of those condenser sections in service measured as per DISCHARGE TEMPERATURE.

8. CONDENSER SHELL

A single heat exchanger in the Circulating Water System which includes two inlet and outlet water boxes and two tube bundles.

9. CONTROL STATION

Sample location that is far enough away from the station that it will not be affected by radiological emissions or other station releases.

21. NORMAL OPERATION

Steady operation at any power level; includes operation with up to 10% of condenser tubes blocked.

22. REPORT LEVEL

The numerical level of an environmental parameter below which the environmental impact is considered reasonable based on available information.

23. SPECIAL STUDY PROGRAMS

Environmental study programs designed to evaluate the impact of station operation on an environmental parameter.

24. TOTAL RESIDUAL CHLORINE

Sum of free available and combined chlorine residuals.

2. The maximum  $\Delta T$  across the condenser shall not exceed 16.5 F for more than 72 consecutive hours for reasons of pump failure, or inoperability due to failure of inter-related equipment.

3. At no time will the  $\Delta T$  across the condenser exceed 27.5 F. In the event that either specification is exceeded, corrective action shall be taken to reduce the  $\Delta T$  to within specification. Such corrective action could include cleaning condenser water boxes or reduction of limit power level, unless an emergency need for power exists.

#### Monitoring Requirement

The temperature differential across the condenser shall be monitored every hour utilizing the computer printout of the intake and discharge temperature measurements. The intake temperature is measured at each of the two inlets to each condenser shell. The discharge temperature is measured at a point downstream of the condenser in each of the six 84-inch ID discharge lines from the condenser shell water boxes. The range of this instrumentation is 0 - 150 F and the system accuracy is  $\pm 0.5$  F.

If the plant computer is out of service, the intake and discharge temperatures shall be monitored every two hours utilizing local reading instrumentation until the plant computer is returned to service.

Bases

The condenser cooling water system was designed to operate at a  $\Delta T$  that would minimize thermal stress to organisms. The U.S. Environmental Protection Agency has set a limit of 27.5<sup>o</sup> as a maximum  $\Delta T$  permitted under the NPDES

### Monitoring Requirements

Same as Specification 2.1.2, except that the discharge temperature shall be monitored every 15 minutes during power reductions at a rate of greater than 25% of full power per hour.

### Bases

All organisms have lower lethal temperatures. In temperate latitudes, such lethal temperatures are generally reached only when the ambient water temperature approaches freezing. The phenomenon of "cold shock" has been found to be most severe during the period of low ambient water temperatures ( $\leq 40^{\circ}$  F). The likelihood of reaching lower lethal temperatures can be minimized by maintaining a heated discharge during the period when ambient temperatures are  $\leq 40^{\circ}$  F. The potential for cold shock and its effects will be minimized since the thermal effluent from one unit will compensate for possible shutdown of the other unit.

Normal plant power reduction rate is less than 25% of full power per hour. Hourly discharge temperature monitoring for normal power reductions is adequate in view of the potentially long periods involved.

2.2 CHEMICAL

2.2.1 BIOCIDES

Objective

To insure that the chlorine residual released from the Circulating Water and Service Water Systems is controlled and will not have an adverse effect on the natural aquatic environment of the receiving waters.

Specification

1. The concentration of free available chlorine in the Circulating Water System and Service Water System shall not be greater than 1.0 mg/liter at the outlet of the final heat exchanger.

If this specification is exceeded, the chlorine addition rate shall be reduced as necessary to operate within the specification.

2. Circulating Water and Service Water pump intakes shall not be chlorinated more than 3 times per day. Chlorination periods shall not exceed thirty minutes. Chlorination of more than 3 Circulating Water pump intakes at one time shall not be permitted.



### Monitoring Requirement

Three of the twelve intakes are chlorinated simultaneously as a group. One outlet water box associated with each of the two groups for Unit 1 and each of the two groups for Unit 2 shall be continuously monitored for free available chlorine residual during treatment. The Service Water System shall be monitored at the 30-inch supply header to the turbine generator area during treatment.

The continuous monitoring (during treatment) shall be performed using a free chlorine residual analyzer equipped with a strip chart recorder. The Circulating Water System and the Service Water System each have a separate free chlorine residual analyzer.

The chlorine monitors shall be calibrated once per month with an amperometric titrator using ASTM Methods D-1253 and D-1427.\*

If the chlorine monitors are inoperable, free available chlorine residual shall be determined by manual analysis of a grab sample taken during the chlorination cycle.

\* For a discussion of precision and accuracy obtainable through amperometric titration, see Standard Methods, 14th edition, pp. 310-313.

## Bases

The Water Quality Certificate issued by the Delaware River Basin Commission for Salem Nuclear Generating Station limits the free chlorine residual in circulating water discharged from the plant to maximum of 0.1 mg/liter. This also conforms to EPA-NPDES requirements of 0.2 to 0.5 mg/liter.

Intermittent treatment of cooling circuits in fresh and brackish water environments with a biocide (chlorine, sodium hypochlorite) is a reliable method for maintaining these circuits free from fouling.

It has been determined from past experience that treatment with chlorine at a concentration of 0.5 mg/liter free available chlorine residual at the heat exchanger outlet (e.g., condenser) for 30 minutes three times a day is usually sufficient for maintaining system cleanliness although higher concentrations in the heat exchangers may be need periodically. The discharge will be diluted sufficiently, however, to maintain the free chlorine residual discharged to the river at 0.1 mg/liter or less.

The circulating water will be chlorinated by controlled injection of sodium hypochlorite into the intake water to the condensers. Three of the twelve intakes are chlorinated at a time as a group. The period of chlorination will be no greater than 30 minutes and will be done 3 times per day. The rate of

sodium hypochlorite addition is controlled to maintain a 1.0 mg/liter free available chlorine residual or less at the condenser outlet. The discharge is diluted with unchlorinated water and the free chlorine residual of the discharge to the river will therefore be less than 0.1 mg/liter.

Three of the twelve intakes are chlorinated as a group. The free chlorine residual of simultaneous samples recently taken from condenser tailpipes 11A, 12A, 13A and condenser tailpipes 11B, 12B, and 13B showed slight but nominal differences among the three outlet condensers, on the same order as instrument accuracy. Therefore, for the purpose of maintaining 1.0 mg/l free available chlorine residual or less at the condenser outlets it will be adequate to monitor only one of the three discharges in each group.

The service water system will be chlorinated at a frequency not to exceed three times a day for periods of not greater than 30 minutes, and not at the same time as the Circulating Water System. The concentration of free available chlorine residual at the outlet of the final heat exchanger will be determined and shall be maintained at 1.0 mg/liter or less. Consequently, the concentration at the discharge to the river will be less than 0.1 mg/liter.

## 2.2.2 SUSPENDED SOLIDS

### Objective

To insure that suspended solids released from Non-Radioactive Chemical Waste Disposal System are controlled and will not have an adverse effect on the natural aquatic environment of the receiving waters.

### Specification

The average suspended solids concentration in the effluent from the Non-Radioactive Chemical Liquid Waste Disposal System shall not exceed 25 mg/liter on an annual basis.

### Monitoring Requirement

A grab sample shall be taken once per day from the collecting basin discharge pipe and analyzed for suspended solids using a method which is acceptable to EPA. The sample shall be taken at the in-line pH monitoring probe in the discharge pipe. Samples shall be taken during periods of actual discharge and only on days when the collecting basin is discharged.

At the conclusion of the first full calendar year following Unit 1 initial criticality, the suspended solids data for both the discharge and the ambient river will be analyzed. The feasibility of increasing the allowable average effluent suspended solids concentration and of decreasing

the sampling frequency will be investigated. Suggested changes to either will be submitted for review and approval by the NRC staff prior to implementation.

#### Bases

The non-radioactive chemical liquid waste basin is licensed to operate under permits issued for Industrial Waste Treatment Plants by the State of New Jersey. The suspended solids limitation of 25 mg/l is that which is required by the permits, but represents only a small percentage of what has been found naturally in the Delaware River in the vicinity of Artificial Island during the Licensee's preoperational monitoring. (Refer to Salem Environmental Specifications, Table 3.1-3). Furthermore, the effluent limitation is not contained in the current NPDES permit. A reduction in sampling frequency to once per week may be recommended if it can be shown that no appreciable harm to the environment due to suspended solids results from the collecting basin discharge and that daily variations in the effluent suspended solids concentration are moderate, particularly after plant startup-related conditions stabilize.

TABLE 2.3-1

## RADIOACTIVE LIQUID SAMPLING AND ANALYSIS

Liquid Source	Sampling Frequency and Analysis	Type of Activity Analysis	Detectable Concentrations ( $\mu\text{Ci}/\text{ml}$ ) <sup>a</sup>
A. Monitor Tank Releases <sup>g</sup>	Each Batch	Principal Gamma Emitters	$5 \times 10^{-7}^b$
	One Batch/Month	Dissolved Gases <sup>f</sup>	$10^{-5}$
	Weekly Composite <sup>c</sup>	Ba-La-140, I-131	$10^{-6}$
	Monthly Composite <sup>c</sup>	H-3	$10^{-5}$
		Gross $\alpha$	$10^{-7}$
	Quarterly Composite <sup>c</sup>	Sr-89, Sr-90	$5 \times 10^{-8}$
B. Primary Coolant	Weekly <sup>d</sup>	I-131, I-133	$10^{-6}$
C. Steam Generator Blowdown	Weekly <sup>e</sup>	Principal Gamma Emitters	$5 \times 10^{-7}^b$
		Ba-La-140, I-131	$10^{-6}$
	One Sample/Month	Dissolved Gases <sup>f</sup>	$10^{-5}$
	Monthly Composite <sup>e</sup>	H-3	$10^{-5}$
		Gross $\alpha$	$10^{-7}$
	Quarterly Composite <sup>e</sup>	Sr-89, Sr-90	$5 \times 10^{-8}$

<sup>a</sup>The detectability limits for activity analysis are based on the technical feasibility and on the potential significance in the environment of the quantities released. For some nuclides, lower detection limits may be readily achievable, and when nuclides are measured below the stated limits, they should also be reported.

<sup>b</sup>For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentrations of such radionuclides using measured ratios with those radionuclides which are routinely identified and measured.

<sup>c</sup>A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged.

<sup>d</sup>The power level and cleanup or purification flow rate at the sample time shall also be reported.

<sup>e</sup>To be representative of the average quantities and concentrations of radioactive materials in liquid effluents, samples should be collected in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite should be thoroughly mixed in order for the composite sample to be representative of the average effluent release.

<sup>f</sup>For dissolved noble gases in water, assume a MPC of  $4 \times 10^{-5} \mu\text{Ci}/\text{ml}$  of water.

<sup>g</sup>Includes waste holdup tanks

TABLE 2.3-3 .

**SALEM STATION LIQUID WASTE SYSTEM  
LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS**

Process Stream or Release Point	Radiation Alarm	Auto Control to Isolation Valve	Gross Activity Continuous Monitor	Grab Sample Station	Measurement						High Liquid Level Alarm
					Gross Activity	I	Dissolved Gases	Alpha	H-3	Isotopic Analysis	
Miscellaneous Tanks <sup>a</sup>				X		X	X	X	X	X	X
Primary Coolant System				X		X					
Liquid Radwaste Discharge Pipe	X	X	X		X						
Steam Generator Blowdown System	X		X	X	X	X	X	X	X	X	
Outdoor Storage Tanks (potentially radioactive) Primary Water Storage Tank Refueling Water Storage Tank				X <sup>b</sup>	X					X	X
Component Cooling Systems	X		X		X						
Turbine Building Sumps (Floor Drains)				X <sup>c</sup>	X					X	X

- a. Includes Waste Monitor Tanks, Waste Monitor Holdup Tank, CVCS Monitor Tanks, Waste Holdup Tanks, Chemical Drain Tanks, Laundry and Hot Shower Tanks.
- b. Grab sample to be taken and analyzed each 8 hours whenever tank leakage exists.
- c. Grab sample to be taken and analyzed each 8 hours whenever the gross activity in the secondary coolant system exceeds  $10^{-5}$  uCi/ml (Except H-3).

TABLE 2.3-4

SALEM STATION GASEOUS WASTE SYSTEM  
 LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS

Process Stream or Release Point	Radiation Alarm	Auto Control to Isolation Valve	Continuous Monitor	Grab Sample Station	Measurement				
					Noble Gas	I	Particulate	H-3	Alpha
Waste Gas Decay Tanks				X	X	X	X	X	X
Condenser Air Removal System <sup>a</sup>	X			X	X	X	X	X	X
Plant Vent	X		x <sup>b</sup>	X	X	X	X	X	X
Building Ventilation Systems									
Reactor Containment Building (whenever there is flow)	X	X	x <sup>d</sup>	X	X	X	X	X	X
Auxiliary Building and Radwaste Area <sup>a</sup>				x <sup>c</sup>	X	X	X	X	X
Fuel Handling & Storage Building <sup>a</sup>				x <sup>c</sup>	X	X	X	X	X
Turbine Gland Seal Condenser <sup>a</sup>				x <sup>c</sup>	X	X	X	X	X
Waste Gas Discharge Line	X	X	X						

2.3-23

<sup>a</sup> Since these process streams or building ventilation systems are routed to the plant vent, the need for a continuous monitor at the individual discharge point to the main exhaust duct is eliminated. One continuous monitor at the final release point is sufficient.

<sup>b</sup> Continuously monitored. Also includes continuous iodine, noble gas and particulate monitors which are in service during waste gas decay tank releases and containment purging operations.

<sup>c</sup> Grab sample stations from which monthly gas samples (Table 2.3-2) are to be taken. Also, grab samples should be taken and measured to determine the process stream or building ventilation system source whenever an unexplained increase is indicated by the plant vent sampler-monitors.

<sup>d</sup> Also includes other than waste decay tank releases and containment purging operations.



TABLE 2.3-5

## GAMMA AND BETA DOSE FACTORS, UNITS 1 AND 2

## SALEM, UNITS 1 AND 2

$X/Q = 1.2E - 6 \text{ sec/m}^3$  @ 1270 Meters, North  
Dose Factors for Vent

Noble Gas Radionuclide	$K_{iv}$	$L_{iv}$	$M_{iv}$	$N_{iv}$
	Total Body (rem/yr) (Ci/sec)	Skin (rem/yr) (Ci/sec)	Beta Air (rad/yr) (Ci/sec)	Gamma Air (rad/yr) (Ci/sec)
Kr-83m	8.6 E -5	0	0.35	0.043
Kr-85m	0.97	1.8	2.4	1.0
Kr-85	0.012	1.6	2.3	0.012
Kr-87	3.0	12	12	3.1
Kr-88	7.4	2.8	3.5	7.8
Kr-89	1.3	12	13	1.4
Xe-131m	0.34	0.57	1.3	0.43
Xe-133m	0.26	1.2	1.8	0.36
Xe-133	0.31	0.37	1.3	0.38
Xe-135m	1.2	0.85	0.89	1.3
Xe-135	1.4	2.2	2.9	1.5
Xe-137	0.18	15	15	0.19
Xe-138	2.9	5.0	5.7	3.0

3.1 NON RADIOLOGICAL SURVEILLANCE

3.1.1 ABIOTIC

3.1.1.1 Chlorine

Objective

To determine the concentration of free available and total residual chlorine in the station effluent water in an effort to maintain an optimum chlorination program for prevention of heat exchanger fouling while minimizing the environmental impact on the receiving waters.

Specification

Grab samples shall be taken monthly (weather permitting) during a chlorination cycle and analyzed for free available and combined residual chlorine. The samples shall be taken at the intake structure (10 ft. below the surface), the outfall of the discharge (8 ft. below the surface), and at a point outside and downstream of the mixing zone (18 ft. below the surface).

Reporting Requirement

In the event the analysis of the sample taken from the point outside and downstream of the discharge water mixing zone indicates that the total residual chlorine at the point exceeds the ambient total residual chlorine level in the river by 0.1 mg/liter, a report shall be made in accordance with Specification 5.6.2.

## Bases

This monitoring program will determine the magnitude and extent of free available and total residual chlorine concentration increases over ambient within and outside the mixing zone. These parameters vary due to changes in chlorination level, tidal conditions, and the chlorine demand of the receiving water.

Chlorine monitoring specified in this section should demonstrate what reduction in chlorine residual occurs in the mixing zone through dilution and the satisfaction of chlorine demand in the receiving water.

Finally, this monitoring is of considerable value in maintaining an optimal chlorination program to prevent heat exchanger fouling. Chlorine demand in the ambient water and the concentration of fouling organisms may be inferred from the quantity of chlorine required to produce a given residual at the condenser outlet.

### 3.1.1.2 Dissolved Gases

#### Objective

To ascertain that the dissolved oxygen level is not depressed to the extent that it may be harmful to the indigenous population of the receiving waters as a result of station operation.

#### Specification

The dissolved oxygen levels shall be monitored once per month (weather permitting) utilizing a method which is acceptable to the EPA. Grab samples shall be taken at the intake structure (10 ft. below the surface), the outfall of the discharge (8 ft. below the surface), and at a point outside and downstream of the mixing zone (18 ft. below the surface).

#### Reporting Requirement

If dissolved oxygen level is found to be less than 6 mg/l at the discharge, a comparison study of the intake, discharge and downstream dissolved oxygen levels shall be conducted to determine if the oxygen depression has been caused by station operation. If it is so determined, a report shall be made in accordance with Specification 5.6.2.

Bases

Monthly analyses of dissolved oxygen will aid in differentiating between normal seasonal fluctuations and changes due to station operation.

The 6 mg/liter limitation is required by the Water Quality Certificate issued by the Delaware River Basin Commission. The EPA recognizes more than one analytical method; therefore none is specified herein.

3.1.1.3 Suspended Solids

Objective

To determine the effect of plant operation on suspended solids in the receiving waters.

Specification

Suspended solids shall be monitored once per month (weather permitting). Grab samples shall be taken at the intake structure (10 ft. below the surface), the outfall of the discharge (8 ft. below the surface), and at a point outside and downstream of the mixing zone (18 ft. below the surface). These samples shall be analyzed for suspended solids by means of a method acceptable to EPA. Dissolved solids shall not be monitored.

### Specification

Grab samples shall be taken once per month (weather permitting) and analyzed for the parameters listed in Table 3.1-1. The samples shall be taken at the intake structure (10 ft. below the surface), the outfall of the discharge (8 ft. below the surface), and at a point outside and downstream of the mixing zone. These samples shall be analyzed for the parameters listed in Table 3.1-1 by a method acceptable to EPA.

### Reporting Requirement

Reporting levels will be developed after the initial phases of plant operation. Post-operational data will be related to preoperational data to yield norms from which report levels will be established.

### Bases

This monitoring program will serve to determine the effect of station operation on the quality of the receiving water. An evaluation of the program, after six months of full power operation, will be performed and those parameters which can be shown to be not significantly affected by station operation will be eliminated from the monitoring program subsequent to NRC staff review and approval. This program is in conformance with NPDES requirements.

The utilization of tests prescribed by EPA will insure the employment of current, state-of-the-art methods and accuracies.

to monthly (weather permitting) (April through September) and monthly to quarterly (October through March) within the study area illustrated in Figure 3.1-1. (See Table 3.1-2 also).

These samples shall be examined quantitatively for chlorophyll a using the spectrophotometric method of Lorenzen. <sup>(1)</sup> The standard error of chlorophyll a analysis at the 5 ug level is  $\pm$  0.18 ug for the mean <sup>(3)</sup> of two determinations.

Generic identification and enumerations shall be conducted. Distributions exhibited by the dominant taxa shall be emphasized.

A productivity study shall be performed bimonthly (May through September) to quarterly (October through April), weather permitting, at appropriate control and thermally affected stations along with chlorophyll a analysis. (See Table 3.1-2).

Dissolved oxygen concentrations shall be determined. A dissolved oxygen probe shall be used to determine dissolved oxygen levels in both light and dark bottles as well as in control samples.

In the event of a probe malfunction, the azide<sup>(4)</sup> modification of the Winkler Method shall be used to measure DO levels.

a. Ichthyoplankton

Ichthyoplankton samples shall be collected monthly (weather permitting) within the study area illustrated in Figure 3.1-1. Surface and near-bottom samples shall be collected at all stations. In addition, mid-water samples shall be collected at offshore stations where depth exceeds 30 ft. at mean low water (MLW). Replicate samples shall be taken at selected stations.



2

Ponar grab sampler which samples an area 0.05 m<sup>2</sup> to a depth of approximately 15 cm. Most benthic organisms shall be identified to species. For specimens damaged in sampling, identification shall be to the lowest possible taxonomic level. The organisms shall be counted, dried, and weighed.

f. Blue Crab

Commercial crabbers shall be censused throughout the crabbing season (usually May through November) by means of daily questionnaires which ask data on the number of pots checks, number of bushels of hard crab, and number of individual moulting crab taken. The numbers of soft crab, mating crab, and egg-bearing female crab observed in pot catches are also noted.

Additionally data on blue crab shall be collected monthly by interviewing and accompanying selected crabbers during their operations. Crab are also collected in the course of the fisheries sampling programs.

g. Fish

Fishes will be samples by seine, trawl, and gill net within the area illustrated in Figure 3.1-1. Sites shall be sampled on a biweekly to quarterly schedule (weather permitting) throughout the year. Appropriate stations

and zones shall be sampled during daylight and at night. Trawl hauls in the river zones shall be of 10-minute duration, 5 minutes in Sunken Ship Cove and 20 minutes in the river channel zones with a 16 ft. semi-balloon otter trawl. In the creeks they shall be of 5 minute duration with a 9 ft. semi-balloon otter trawl. Trawl hauls shall be made at a uniform speed, traveling with the tide. Seine collections shall be made parallel to the shore line. Seines may be used in combination and may include a 1/4 inch mesh, 25 ft. bag seine; a 1/4 inch mesh, 10 ft. flat seine; a 1/8 inch mesh, 10 ft. flat seine; and a 1/2 inch mesh, 225 ft. seine. Fishes shall be identified and enumerated by species and representative subsamples shall be measured for length.

Gill nets shall be fished in the spring to sample populations of anadromous fishes. Gill nets of stretched mesh sizes 5-1/2 inches and 3-1/8 inches shall be drifted after being set perpendicular to the current. Anadromous specimens shall be identified to species, sexed, and measured to the nearest <sup>five</sup> millimeters.

## 2. Terrestrial Studies

Studies of the Terrestrial Environment shall include:

1. Seasonal monitoring (June through November, weather permitting) of nesting by the diamondback terrapin on Sunken Ship Cove Beach and in regions outside the thermal plume.

and zones shall be sampled during daylight and at night. Trawl hauls in the river zones shall be of 10-minute duration, 5 minutes in Sunken Ship Cove and 20 minutes in the river channel zones with a 16 ft. semi-balloon otter trawl. In the creeks they shall be of 5 minute duration with a 9 ft. semi-balloon otter trawl. Trawl hauls shall be made at a uniform speed, traveling with the tide. Seine collections shall be made parallel to the shore line. Seines may be used in combination and may include a 1/4 inch mesh, 25 ft. bag seine; a 1/4 inch mesh, 10 ft. flat seine; a 1/8 inch mesh, 10 ft. flat seine; and a 1/2 inch mesh, 225 ft. seine. Fishes shall be identified and enumerated by species and representative subsamples shall be measured for length.

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## 2. Terrestrial Studies

Studies of the Terrestrial Environment shall include:

1. Seasonal monitoring (June through November, weather permitting) of nesting by the diamondback terrapin on Sunken Ship Cove Beach and in regions outside the thermal plume.

2. A monthly (weather permitting) bird survey in the area of Artificial Island.
3. Monitoring of occurrence and nesting of the osprey and southern bald eagle within a general 5-mile radius of the station.

TABLE 3.1-1

WATER QUALITY ANALYSIS PARAMETERS

<u>Parameter</u>	<u>mg/l as</u>
Residue, Total Nonfilterable (Suspended)	-
Residue, Total Volatile	-
Calcium, Total (Ca)	Ca
Magnesium, Total (Mg)	Mg
Sodium, Total (Na)	Na
Potassium, Total (K)	K
Iron, total (Fe)	Fe
Copper, total (Cu)	Cu
Manganese, Total (Mn)	Mn
Zinc, total (Zn)	Zn
Chromium, Total (Cr)	Cr
Nitrogen, Ammonia (N)	N
Kjeldahl Nitrogen (N)	N
Chloride (Cl)	Cl
Sulfate (SO <sub>4</sub> )	SO <sub>4</sub>
Silica, Dissolved (SiO <sub>2</sub> )	SiO <sub>2</sub>
Nitrogen, Nitrate	N
Specific Conductance (umhos/cm)	-
Turbidity (FTU)	-
Chemical Oxygen Demand (COD)	COD
Organic Carbon, Total (TOC)	TOC
Chlorine Demand, 30 seconds	Cl <sub>2</sub>
Chlorine Demand, 3 minutes	Cl <sub>2</sub>
Chlorine Residual, ambient river, free available	Cl <sub>2</sub>
Chlorine Residual, ambient river, combined	Cl <sub>2</sub>
Biochemical Oxygen Demand (BOD)	BOD
Phenols	Phenols
Carbon Dioxide, Free (CO <sub>2</sub> )	CO <sub>2</sub>
Sulfide, Total (S)	S
Dissolved Oxygen (DO)	DO
Alkalinity, Phenolphthalein	CaCO <sub>3</sub>
Alkalinity, Methyl Orange	CaCO <sub>3</sub>
pH	-
Total Phosphorus (P)	P

TABLE 3.1-2

## SUMMARY OF AQUATIC, TERRESTRIAL AND AERIAL SAMPLING PROGRAM

<u>Sample</u>	<u>Method</u>	<u>Sampling Frequency</u> *	<u>Area Sampled Relative to Station (Mile 0)</u>	
			<u>North</u>	<u>South</u>
<u>Aquatic</u>				
Phytoplankton	Water bottles and other gear as appropriate	Biweekly to quarterly	to 7.5 mi.	to 5.0 mi.
Zooplankton	Metered filter pump system fitted to plankton net	Monthly	7.5	5.0
Benthos	Ponar grab	Monthly to bimonthly	4.5	5.0
Blue Crab	Trawl haul, commercial crabbers	Biweekly to quarterly	8.5	9.0
Fisheries	Seines (Estuary)	Biweekly to monthly	6.5	4.0
	Trawls (Estuary)	Biweekly to monthly	8.5	9.0
	Trawls (Creek)	Biweekly to monthly	5.0	2.0
	Gill nets (Estuary)	Biweekly to quarterly	6.5	9.0
	Seines (Creek)	Biweekly to quarterly	5.0	0.0
Ichthyoplankton	Metered plankton net	Monthly	7.5	5.0
<u>Terrestrial and Aerial</u>				
Diamondback Terrapin	Visual observations	Seasonal	0.0	3.0
Birds	Visual observations	Biweekly to quarterly	Within 3-5 mile radius of site	

\*In the appropriate season, weather permitting

4.0

SPECIAL SURVEILLANCE AND STUDY ACTIVITIES

4.1

EXPERIMENTAL ENTRAINMENT STUDIES

Objective

To estimate the effect of rapid temperature and pressure changes in the Circulating Water system on ichthyoplankton and zooplankton.

Specification

Responses to short duration increases in temperature and pressure which closely approximate those in the Circulating Water Systems will be determined for the more common entrainable organisms in the vicinity of Artificial Island.

The following species of fishes and crustaceans will be tested (contingent upon their availability): white perch, Morone americana; striped bass, Morone saxatilis; alewife, Alosa pseudoharengus; blueback herring, Alosa aestivalis; scud, Gammarus sp.; opossum shrimp, Neomysis americana; sand shrimp, Crangon septemspinosa; and grass shrimp, Palaemonetes pugio. Other species will be tested as they are available and as scheduling permits. Size range of test organisms will be between 2 and 50 mm (0.07 and 1.96 inches) total length.

Organisms will be considered acclimated to ambient field conditions at their point of capture and will be held under similar conditions for at least 48 hours prior to

testing, a period which has been found more than sufficient to eliminate specimens in poor physical condition.

Larval fishes will be hatched in the laboratory under conditions similar to those in the spawning areas.

Tests will be conducted in a rigid transparent PVC apparatus in which the effects of temperature and pressure can be evaluated independently and concurrently.

Temperature will be measured with a standardized mercury thermometer (precision, 0.5 C) within the test chamber and pressure with a Robertshaw test gauge (precision, 1/2 mm Hg) connected to the atmosphere in the test chamber.

Other variables monitored will include salinity, pH, and oxygen content. Salinity of the water will be measured with a salinometer (precision, 0.1 ppt) prior to testing.

Determination of pH will be made with a pH meter (precision, 0.1 pH unit) before testing. Oxygen content of the water will be verified with an oxygen meter (precision, 0.1 mg/l) prior to testing.

Test organisms and water will be collected simultaneously to assure a water sample representative of the physical chemical parameters experienced by the test organism prior to its collection.

Test organisms will be exposed to various combinations of test conditions. Acclimation temperature will vary seasonally within the range 5 to 30 C (41-86 F). Test salinities will



! be appropriate levels within the range 0 to 1 ppt, pH between 7.0 and 8.0, and oxygen content near air saturation. Temperature increases for test organisms will be from 7.5 to 15 C (13.5-27 F) above ambient (acclimation). Test organisms will be exposed to pressures from 69 to 180 cm Hg absolute (-1.4 to 20.1 psig) in a sequence simulating passage through the condenser cooling system.

A general control group will be placed in a holding container. A handling control will receive standard handling in the apparatus, but will not be exposed to changes in either temperature or pressure. Test organisms will be exposed to one of three experimental conditions: pressure changes only, temperature changes only, or both temperature and pressure changes concurrently. Observations will be made on the test organisms during and immediately after testing and at appropriate intervals through a 96-hour period to determine immediate and long-term effects.

These studies will be conducted for a period of 1 year after Unit 1 becomes operational.

#### Reporting Requirements

Results of these studies shall be reported in accordance with Specification 5.6.1.

Bases

These studies and subsequent data analyses will aid in determining whether the temperature and pressure conditions in the Circulating Water System will have a deleterious effect on entrainable organisms.

#### 4.2.3 TEMPERATURE AND CHEMICAL AVOIDANCE STUDIES

The avoidance design to be employed in these studies is a modification of the design employed first by Shelford and Allee.<sup>(1)</sup> In this modified design a control and a replicate are determined simultaneously. The apparatus is constructed such that, in thermal tests, water of differing temperatures flows into the opposing ends of a divided trough and then drains at the center. In chemical tests, various concentrations of the compound are substituted for the temperature increase. Due to the sharp gradient at the center drain the apparatus is effectively divided into quadrants. The water temperature (or chemical composition) is the same in diagonally opposed quadrants, but different in those directly opposed. One set of diagonally opposed quadrants is designated as experimental, the other set as control. Temperatures in the directly opposed quadrants are increased in step gradients, with the experimental quadrants being 3° to 5° F higher than the control quadrants. In the chemical tests, only the chemical concentration in the experimental quadrant is increased. Equal numbers of specimens are placed in each quadrant. The length of time spent by each specimen in each respective quadrant is continuously measured over a 5- to 15-minute test period. This results in a frequency distribution which is then analyzed by a ratio procedure to determine the significance of the response to the chemical

concentration or temperature increase. Tests begin at ambient temperature and continue through the step gradient until a significant avoidance response is given in both subtroughs. Responses to chlorine (both free and combined states) will be determined. Responses to other chemical compounds will be determined as needed or recommended.

Oxygen and pH will be monitored throughout all tests. The precision of the oxygen measurements is 0.1 mg/l; that of pH is 0.1 pH unit. Free and combined chlorine residuals will be determined by amperometric titration or an equivalent method. The precision of these measurements is 0.01 ppm and the limit of

5.0 ADMINISTRATIVE CONTROLS

5.1 RESPONSIBILITY

- 5.1.1 The implementation of the surveillance programs external to the plant, including sampling, sample analysis, evaluation of results and the preparation of required reports is the responsibility of the Licensing and Environment Department in the Engineering and Construction Department. This Department is responsible for the assignment of personnel to the above functions, for assurance that appropriate written procedures, as described in Section 5.5.1, are utilized in the surveillance program activities and for assuring the quality of surveillance program results, as described in Section 5.5.3.
- 5.1.2 The Station Manager or his delegated alternate is responsible for operating the plant in compliance with the limiting conditions for operation as specified in the Environmental Technical Specifications and for the in-plant monitoring necessary to ensure such operation. His responsibility includes assurance that plant activities are conducted in such a manner as to provide continuing protection to the environment and that personnel performing such activities use appropriate written procedures as described in Section 5.5.

## 5.2 Organization

5.2.1 Figure 5.2-1 identifies the corporate relationship between the Licensing and Environmental Department and the station Manager and also shows the organization of the Licensing and Environment Department. Figure 6.2.2 of the Radiological Safety Technical Specifications identifies the Production Department Station Organization.

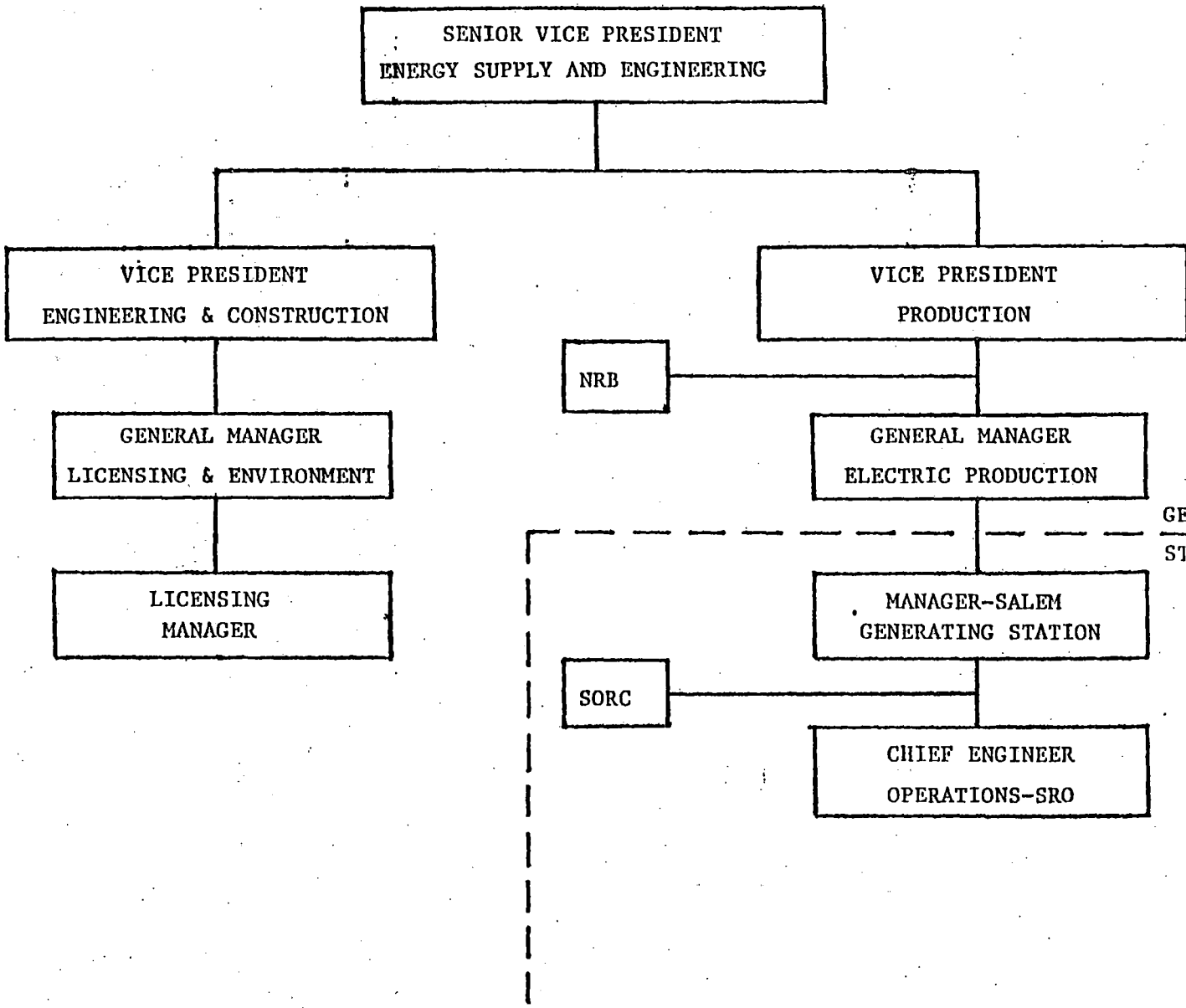
5.2.2 The Nuclear Review Board (NRB) and Station Operations Review Committee (SORC) are shown in Figure 5.2-1. They are advisory groups to the Vice President - Production and the station Manager respectively.

PUBLIC SERVICE ELECTRIC AND GAS COMPANY  
SALEM NUCLEAR GENERATING STATION

Organization Chart Showing Corporate  
Interrelationships

FIG. 5.2-1

5.2-2



GENERAL OFFICE  
STATION ORGANIZATION