ST. LUCIE PLANT: UNIT No. 1 Compliance With APPENDIX I, 10 CFR50

(Docket No. 50-335)

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ABSTRACT

The following report examines the compliance of FLORIDA POWER and LIGHT COMPANY'S ST. LUCIE PLANT, UNIT No. 1 with the NRC Staff's position on APPENDIX I, 10CFR50. Based on the models and subsequent analyses developed in the report, the following conclusions can be made:

1. The "as-built" gaseous and liquid treatment systems of UNIT No. 1 meet the requirements of Paragraphs II A, B and C of APPENDIX I.

2. The augments already included in UNIT No. 1's systems have provided controls of effluent releases that have gone beyond the point of cost-effectiveness and respond fully to the requirements of Paragraph II D of APPENDIX I.

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* Unless stated, all TABLE titles are prefixed by either "ST. LUCIE UNIT No. 1" or "ST. LUCIE PLANT".

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SECTION 1.0

STATEMENT OF REQUIREMENTS

1.0 STATEMENT OF REQUIREMENTS

1.1 Introduction

On April 30, 1975, the Nuclear Regulatory Commission issued its Final Opinion in the matter of the Rule Making Hearing (RM-50-2) on "Numerical Guides For Design Objectives and Limiting Conditions For Operation To Meet The Criterion 'As Low As Practicable' For Radioactive Materials In Light-Water-Cooled Nuclear Power Reactor Effluents." This Final Opinion is the basis for this FLORIDA POWER and LIGHT COMPANY statement about its ST. LUCIE PLANT Unit #1's compliance with APPENDIX I, 10CFR50.

1.2 The NRC's FINAL OPINION Restated

This opinion provides in part that "the operator shall provide reasonable assurance"that the following design objectives will be met:

A. "The calculated annual total quantity of all radioactive material above background (1) to be released from each light-water-cooled nuclear power reactor to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millirems to the total body or 10 millirems to any organ.

B.1 "The calculated annual total quantity of all radioactive material above background to be released from

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(1) Here and elsewhere in this APPENDIX I, Background means radioactive materials in the environment and in the effluents from light-water-cooled power reactors not generated in, or attributable to, the reactors of which specific account is required in determining design objectives.

each light-water-cooled nuclear power reactor to the atmosphere will not result in an estimated annual air dose from gaseous effluents at any location near ground level which could be occupied by individuals in unrestricted areas in excess of 10 millirads for gamma radiation or 20 millirads for beta radiation.

B.2 "Notwithstanding the guidance of paragraph B.1: (a) The Commission may specify, as guidance on design objectives, a lower quantity of radioactive material above background to be released to the atmosphere if it appears that the use of design objectives in paragraph B.1 is likely to result in an estimated annual external dose from gaseous effluents to any individual in an unrestricted area in excess of 5 millirems; and (b) design objectives based upon a higher quantity of radioactive material above background to be released to the atmosphere than the quantity specified in paragraph B.1 will be deemed to meet the requirements for keeping levels of radioactive materials in gaseous effluents as low as practicable if the applicant provides reasonable assurance that the proposed higher quantity will not result in an estimated annual external dose from gaseous effluents to any individual in unrestricted areas in excess of 5 millirems to the total body or 15 millirems to the skin.

C. "The calculated annual total quantity of all radioactive iodine and radioactive material in particulate form above background to be released from each light-water-cooled nuclear power reactor in effluents to the atmosphere will not result in an annual dose or dose commitment from such radioactive iodine and radioactive material in particulate form for any individual in an unrestricted area from all pathways of exposure in excess of 15 millirems to any organ.

D. "In addition to the provisions of paragraphs A, B, and C above, the applicant shall include in the radwaste system all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return, can for a favorable cost-benefit ratio effect reductions in dose to the population reasonably expected to be within 50 miles of the reactor. As an interim means and until establishment and adoption of better values (or other appropriate criteria), the values of $1,000 per total body man-rem and $1,000 per man-thyroid rem (or such lesser values as demonstrated to be suitable in a particular case) shall be used in the cost-benefit analysis."

SECTION 2.0

GENERAL INFORMATION ON INPUTS USED TO DETERMINE ST. LUCIE PLANT, UNIT No. 1's COMPLIANCE WITH APPENDIX I REQUIREMENTS

2.0 GENERAL INFORMATION ON INPUTS USED TO DETERMINE ST. LUCIE PLANT, UNIT No.1's COMPLIANCE WITH APPENDIX I REQUIREMENTS

2.1 INTRODUCTION

ST. LUCIE PLANT UNIT No. 1's compliance with paragraphs II-A,-B and -C of NRC's FINAL STATEMENT has been demonstrated in Section 5.D of the "ST. LUCIE UNIT No.1's ENVIRONMENTAL STATEMENT" (1). Its installed gaseous and liquid radwaste systems satisfy the cost-benefit analysis required by Paragraph D of the same statement.

However, to satisfy the Commission's decision regarding numerical guides for design objectives and limiting conditions for operation to meet the criterion for "as low as practicable" for radioactive materials in effluents from light-water-cooled nuclear power reactors, additional information and data have been acquired to extend this previous characterization of the sources of radioactive material, transport pathways and resultant doses from ST. LUCIE PLANT, UNIT No.1. Thus, this Section 2.0 provides a compilation of information and data basic to the calculational models used to convert gaseous and liquid source term releases into the individual and population doses given in Sections 3 and 4 that follow.

2.2 USE OF STAFF REGULATORY GUIDES

In carrying out the calculations described in later sections of this report, use has been made, to the greatest extent possible, of the Regulatory Guides issued by the Staff to provide guidance in the implementation of APPENDIX I. Except, where specifically cited in our document, the equations, methods,and suggested parameters of these Guides have been used throughout our calculations:

- RG 1.109 - Calculation of Annual Average Doses To Man From Routine Releases of Reactor Effluents For The Purpose of Evaluating Compliance With 10CFR50, APPENDIX I (Date of issue: March, 1976).
- RG 1. BB - Calculation of Releases of Radioactive Materials In Liquid And Gaseous Effluents From Pressurized Water Reactors, September, 1975.
- RG 1.111 - Methods For Estimating Atmospheric Transport and Dispersion of Gaseous Effluents In Routine Releases From Light-Water-Cooled Reactors (Date of issue: March 1976).
- RG 1.110 - Cost-Benefit Analysis For Radwaste Systems For Light-Water-Cooled Nuclear Power Reactors (Date of issue: March, 1976).

2.3 ST. LUCIE PLANT: Site Characteristics

ST. LUCIE PLANT is located on Hutchinson Island in St. Lucie County, State of Florida, about halfway between Ft. Pierce and Stuart on the East Coast of Florida. Its site characteris-

tics are these:

a. It is on a 1132-acre tract land with its site Eastern boundary the Atlantic Ocean and the site Western boundary the Indian River, a salt water estuary.

b. FIGURE 2.3-1 is a property plan of the site. The terrain is generally flat, covered with water and has a dense vegetation characteristic of Florida coastal mangrove swamps. At the ocean shore, the land rises slightly in a dune or ridge approximately 15 feet above mean low water.

c. The site area boundaries from the outer surface of UNIT No. 1's containment building coincide with the Company-owned plant site property lines, except for the Florida State Route AIA highway easement, the Atlantic Ocean and the Indian River shorelines.

d. The containment building centerline distances to the plant boundary and/or ocean and river shorelines for the 16 cardinal points are given in TABLE 2.3-1.

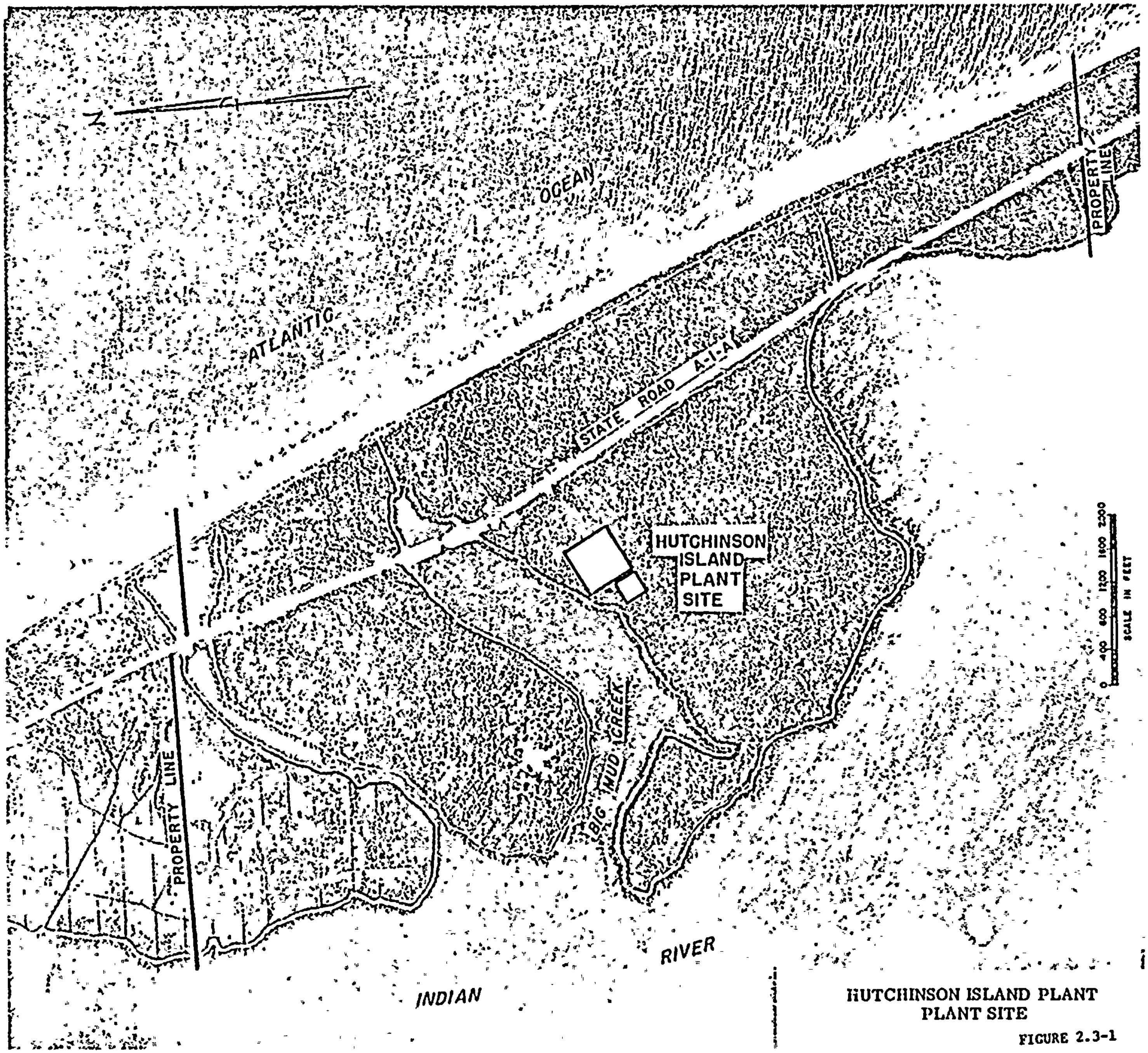
e. TABLE 2.3-1 also gives information about the distances and directions that UNIT No. 1 containment building is from the nearest residence, vegetable garden and milk-bearing animals.

f. FIGURE 2.3-2 shows the topography feature of the area within at least 10 miles of UNIT No. 1's location.

TABLE 2.3-1

ST. LUCIE PLANT, UNIT No.1: Centerline Distances From Unit's Containment Building To Site Boundary And Nearest Activity

	Distance To		
Direction	Nearest Resident	Nearest Milk-Producing Animal	Site Boundary, Feet
NNE			3,675
NE			2,550
ENE			2,700
E			3,000
ESE			3,675
SE			6,600
SSE			6,825
S			6,150
SSW		7.5 miles	3,300
SW			3,000
WSW	1.5 miles		3,675
W			4,275
WNW			3,750
NW			3,600
NNW			5,700
N			5.150



HUTCHINSON ISLAND PLANT
PLANT SITE

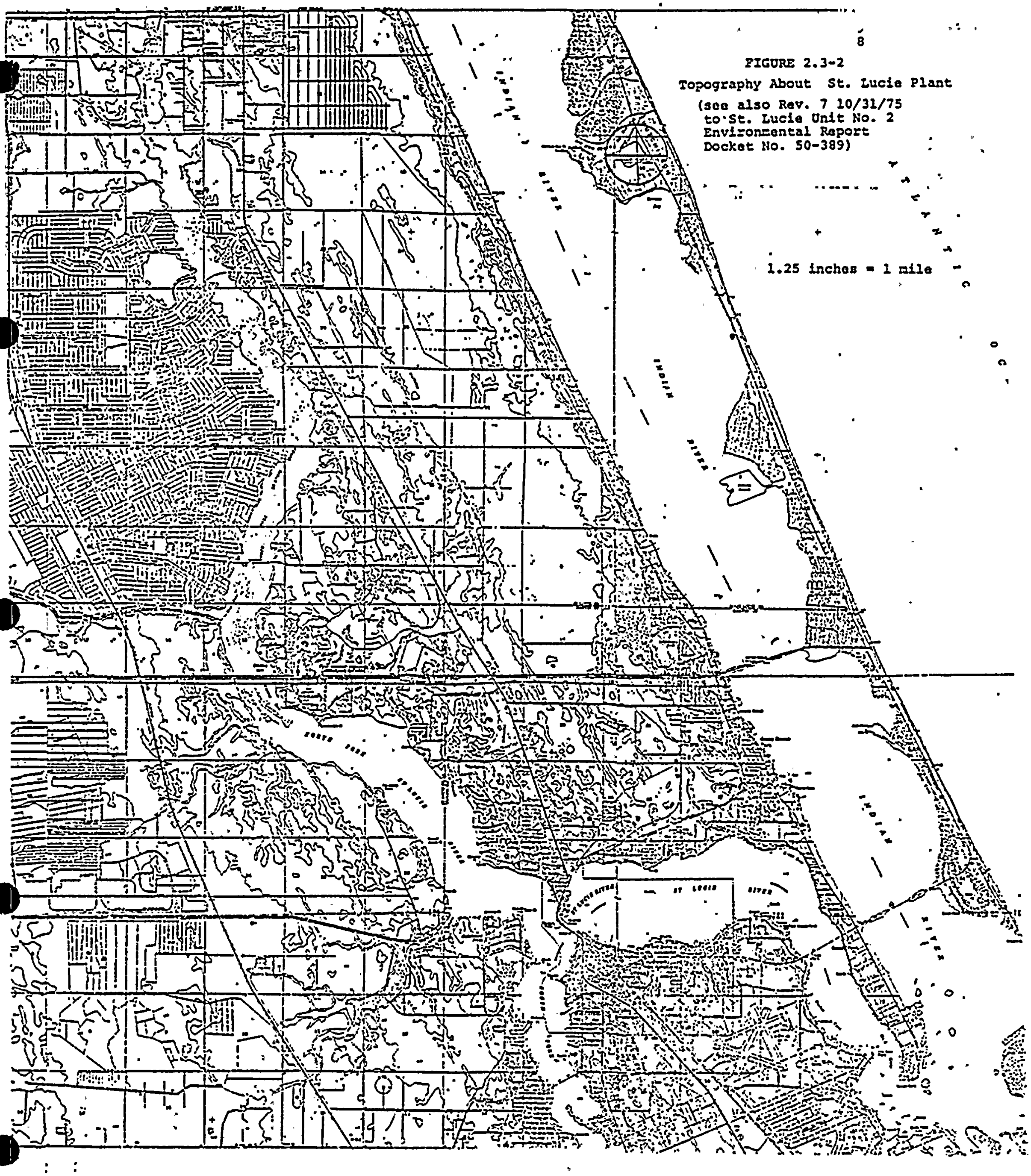
FIGURE 2.3-1

FIGURE 2.3-2

Topography About St. Lucie Plant

(see also Rev. 7 10/31/75 to St. Lucie Unit No. 2 Environmental Report Docket No. 50-389)

1.25 inches = 1 mile



2.4 CALCULATIONAL MODELS

The extensive calculations required to determine the compliance of ST. LUCIE PLANT, UNIT No. 1 with APPENDIX I requirements made use of these following codes:

2.4.1 For Conversion of Source Terms Into Release Data

The GALE Code - provided by the Staff to compute the source term releases of both the gaseous and liquid effluents from the reactor.

2.4.2 For Conversion of Release Data Into Doses To Individuals and Populations

These four basic codes were developed by NUCLEAR SAFETY ASSOCIATES, Bethesda, Maryland to convert release data into individual and population dose rates:

a. The GASI Code - converts gaseous source term releases into doses to an individual;

b. The GASP Code - converts gaseous source term releases into population doses;

c. The LINDY Code - converts liquid source term releases into doses to individuals; and

d. The LIP Code - converts liquid source term releases into doses to populations.

Although codes were built independently of similar NRC Codes, guidelines from Regulatory Guide 1.109 and data banks from parallel NRC Codes were used to construct them.

2.4.3 Supplemental Calculational Models

The meteorological inputs to these calculations made use of the data developed from these following codes (2):

a. <u>Code LSD-1</u>: For average hourly meteorological values. These data include 50-foot wind directions by sector temperature, dew points, the horizontal and vertical Pasquill stability, rainfall to the nearest hundreth of an inch, and the barometric pressure every 6-hour period;

b. <u>Code LSD-2</u>: Consists of the joint percent occurrence of wind direction, adjusted 10-meter wind speed and Pasquill vertical and horizontal stability classes;

c. <u>Code LSD-3:</u> Presents the distribution of hourly χ/Q values by intervals, observations, percent of occurrence and cumulative percent of occurrence at the minimum site boundary of 1555 meters;

d. <u>Code LSD-4</u>: Provides the highest calculated relative concentration by wind direction and time period and distance;

e. <u>Code LSD-5</u>: Provides annual relative concentration data as a function of wind direction and distance;

f. <u>Code LSD-6</u>: Summarizes one year of climatological non-diffusion data, and

g. <u>Code LSD-7</u>: Tabulates the annual frequency occurrence of the joint persistence of wind direction and atmospheric stability for vertical Pasquill stabilities A through G.

Data derived from the use of these codes and used in this compliance document can be found in DAMES and MOORE'S annual meteorological summary of 1973 (3). Data relevant to 1974 and 1975 have been collected and are being analyzed by DAMES and MOORE (4).

2.5 <u>METEOROLOGICAL INPUTS</u>

ST. LUCIE PLANT carries out a continuous program of collecting meteorological data. After its acquisition, it is processed by an expert group of meteorologists (3). The instrumentation for this program and the basic equations used to describe the acquired

data are summarized as follows:

2.5.1 Instrumentation: The meteorological program has been in operation at ST. LUCIE PLANT since 1970. Its 200-foot steel-framed tower is located on relatively flat terrain 2,400 feet NORTH of the reactor site. Its instrumentation includes:

a. Wind Sensors: 6-bladed Aerovanes mounted at the 50- and 190-foot levels above grade on the steel-frame tower. The starting speed of the directional vane and the anemometer blades are equal to or less than 3.0 mph and 1.0 mph, respectively. Wind direction and speed are continuously recorded on strip charts for both elevations.

b. Temperature Sensors: Dual Climet, shielded, aspirated, platinum thermometers are installed at the 32.8-, 110- and 200-foot levels on the steel frame tower. Readings are continuously recorded on two multipoint recorders, one for temperature and the second for ΔT. The performance of these instruments is within 0.2 degree Fahrenheit with a calibration accuracy of $\pm$ 1/4 percent.

c. Rain Gauge: Measured by a standard ESSA weighing type continuous recorder.

d. Dew Point and Temperature Sensor: A dew cell, recorded on a temperature recorder with an accuracy of $\pm$ 0.5 percent Fahrenheit between 10 and 90 percent relative humidity, is located at the 32.8-foot level of the tower.

e. Atmospheric Pressure: Measured by a microbarograph recorder.

All of the instrumentation is constructed of durable materials, suitable for accurate engineering estimates of the diffusion climatology. Routine monthly calibrations of each instrument are conducted. These calibrations include comparison of recorded wind speeds with a hand-held anemometer; dry and wet bulb temperatures with mercury thermometers; wind direction

by visual sighting; and a comparison of redundant systems. Also, weekly operational inspections of all tower equipment are performed.

2.5.2 Computation of Meteorological Data: All meteorological data at the various diffusion elevations are recorded on strip charts, reduced to mean hourly data and placed on computer punch cards for data reduction by the complete online instrument system installed in March, 1971. Using LSD Codes 1 through 7 (3), these computer data were computed.

a. Wind direction at the 50- and 190-foot levels of the meteorological tower reduced to its variability for the 16 cardinal points, i.e., 22.5-degree sectors;

b. Range of the horizontal wind direction variabilities for the 50- and 190-foot levels;

c. Wind speeds at the 50- and 190-foot levels; and

d. Vertical temperature lapse rates for the 110 minus 32.8 feet and 200 minus 32.8 feet levels.

This onsite meteorological program at ST. LUCIE PLANT provides practical dispersion climatology to plan safe releases of radioactive effluents and to determine conservative meteorological parameters that can be used in estimating the potential consequences of hypothetical accidents. The meteorological inputs used in computing the data to show ST. LUCIE PLANT, UNIT No.1's compliance with APPENDIX I was acquired during the 12 months of 1973 (3).

These additional inputs are also appropriate to all of the meteorological data tabulations given elsewhere in this section:

a. The ST. LUCIE PLANT onsite meteorological program follows the recommendations of Regulatory Guide 1.23.

b. The 50-foot tower level wind data were used, because they conservatively approximated the near-ground potential releases from UNIT No. 1. In 1973, about 0.1% (11 hours) of the 50-foot level wind data was missing or invalid. In those time periods, data acquired at the 190-foot level were substituted to complete the calculations.

When the 50-foot level speeds were invalid, the 190-foot level wind speeds were first reduced to the 10-meter level by the Pasquill definition of the vertical temperature lapse rates (TABLE 2.5.2-1) and the horizontal stabilities as a function of wind variability (TABLE 2.5.2-2), and then corrected to the speeds at the 50-foot level by the following wind speed power law:

$$\mu_{10\ \text{meters}} = \mu_h \left(\frac{10\ \text{meters}}{h\ \text{meters}}\right)^n \qquad \text{Eq. 1}$$

where

μ = wind speed, mph

h = either the 50-foot (15.2 meters) or the 190-foot (57.9 meters) height if the 50-foot wind speed was missing or invalid.

n = 0.25 for Pasquill A, B, C and D; or 0.50 for Pasquill E, F and G.

It should be noted that this is NRC's recommended technique of standardization so that different sites can be compared on equal terms.

c. TABLE 2.5.2-3 lists the ST. LUCIE PLANT "on-shore" and "off-shore" wind direction sectors. This summation of wind distribution in the dual stability categories indicates that the majority of the stable, poor atmospheric conditions (Pasquill E, F and G) occur with the seven off-shore wind directions (SOUTH clockwise to NORTHWEST) while the unstable and neutral atmospheric conditions (Pasquill A, B, C and D) are associated with the nine on-shore

TABLE 2.5.2-1

ST. LUCIE PLANT UNIT NO. 1: Vertical Stability Class

By Temperature Difference[(a)]

Pasquill Class	Description	ΔT(F°) 190 Feet
A	Extremely Unstable	≤-2.0
B	Unstable	-1.9 to -1.8
C	Slightly Unstable	-1.7 to -1.6
D	Neutral	-1.5 to -0.5
E	Slightly Stable	-0.4 to +1.5
F	Stable	+1.6 to +4.2
G	Extremely Stable	>+4.2

a) Includes data through April 4, 1973

TABLE 2.5.2-2

ST. LUCIE PLANT, UNIT NO. 1: Horizontal

Stability Class By Wind Variability

Pasquill Class	Description	Range of Std. Deviation, σθ, Degrees
A	Extremely Unstable	>22.6°
B	Unstable	22.5 to 17.6
C	Slightly Unstable	17.5 to 12.6
D	Neutral	12.5 to 7.6
E	Slightly Stable	7.5 to 3.9
F	Stable	3.8 to 2.1
G	Extremely Stable	≤2.0

TABLE 2.5.2-3

ST. LUCIE PLANT, UNIT No. 1: On-Shore and Off-Shore Wind Direction Sectors

Sectors	Wind Direction
NNE	On-shore
NE	On-shore
ENE	On-shore
E	On-shore
ESE	On-shore
SE	On-shore
SSE	On-shore
S	Off-shore
SSW	Off-shore
SW	Off-shore
WSW	Off-shore
W	Off-shore
WNW	Off-shore
NW	Off-shore
NNW	On-shore
N	On-shore

wind directions (NORTH NORTHWEST clockwise to SOUTH SOUTHEAST).

d. The atmospheric dispersion potentials of the ST. LUCIE PLANT site have been determined by computing the hourly relative concentrations for a total year of data (1973) and then selecting the appropriate occurrence level for the time period of interest. Invalid data during the one-year period of record represented 35 hours (or 0.4% of the total) and were not included in the sample population. Winds of less than 1.0 mph and calm wind conditions were assigned a value of 1.0 mph.

The relative concentrations at the minimum boundary of 1,555 meters (5,100 ft.) for each hour of the one-year period of record (1973) were calculated by this equation:

$$\chi/Q = \frac{1}{\mu(\pi \sigma_y \sigma_z + CA)} \qquad \text{Eq. 2}$$

where

χ/Q = relative concentration, seconds per cm^3

μ = average hourly wind speed, mps, adjusted to the 5-meter elevation

σ_y = horizontal dispersion as determined by the standard deviation of the hourly horizontal wind variability in meters

σ_z = vertical dispersion as determined by the vertical temperature lapse rate in meters

CA = one-half the minimum cross-sectional area of the containment structure = $1363m^2$.

e. The following equation was used to determine the monthly average relative concentration, over a 22.5 degree sector and for one year of consecutive hourly observations, in each of the 16 cardinal directions:

$$\chi/Q = 1/n \sum_{i=1}^{n} \frac{2.032}{u_i \sigma_{zi} D} \qquad \underline{\text{Eq. 3}}$$

where

χ/Q = average relative concentration in seconds per m^3 for time period of interest for each sector

u = average hourly wind speed in meters per second with a minimum assignment of 0.447 meters per second (1.0 mph)

σ_{zi} = vertical dispersion as determined by the vertical temperature lapse rate in meters

D = the distance in meters to the low population zone, distance of 8,045 meters

n,i = the average time periods of 8 hours, 16 hours, 3 days and 26 days

2.032 = a constant that incorporates a sector spread of 22.5 degrees, $\pi/8$ radians

The atmospheric dilution factors from these data were tabulated in descending order of magnitude with the most conservative dilution factor first.

f. The average annual values of relative dilution were computed by this equation:

$$\frac{\bar{\chi}}{Q(I,x)} = \frac{1}{n} \sum_{i=1}^{n} \frac{2.032}{ux\left(\sigma^2_{z(P,x)} + \frac{cv^2}{\pi}\right)^{\frac{1}{2}}} \qquad \underline{\text{Eq. 4}}$$

where

$\frac{\bar{\chi}}{Q(I,x)}$ = average annual relative dilution for each sector, I, and distance, x (meters)

$\sigma_{z(P,x)}$ = vertical dispersion coefficient (meters)

u = average hourly wind speed in the specific sector (mps) with a minimum assignment of 0.447 meters per second (1.0 mph)

x = distance in meters

n,i = the valid hourly data samples for one year

c = 0.5, a dimensionless constant, and

v = vertical height of containment structure = 62.33 meters

However, $\left(\sigma^2_{z(P,x)} + \frac{cv^2}{\pi}\right)^{\frac{1}{2}} \leq \sqrt{3}\ \sigma_{z(P,x)}$.

EQUATION 4 was used to compute the average annual values of relative dilution for the 16 cardinal directions out to a distance of at least 45 miles. It should be noted that this equation is a less conservative one than that recommended in the Staff's Regulatory Guide 1.42.

2.6 <u>FUNDAMENTAL INPUT TERMS</u>

There are certain design characteristics of UNIT No.1's reactor that become fundamental inputs to the calculation of source terms by the PWR-GALE Code and the subsequent use of these terms in computing individual and population doses. These GALE inputs are tabulated in TABLE 2.6-1 and are supported by the information appearing in SUPPLEMENT A, which was developed according to the guidelines outlined in APPENDIX D of the Staff's Regulatory Guide 1.BB.

TABLE 2.6-1

ST. LUCIE PLANT, UNIT No. 1: GALE Input

Terms Common To UNIT No. 1's Reactor

Card No.	Spaces	Entry	Item	Units	Comments
1	33-60	ST. LUCIE 1	Reactor Name		
2	73-80	2700	Maximum Thermal Power	mwt	
3	73-80	487	Mass Primary Coolant	10^3 lb	
4	73-80	40	Purification Letdown Flow	gpm	
5	73-80	8	Cation Demin. Flow	gpm	
6	73-80	2	No. of Steam Generators		
7	73-80	11.2	Total Steam Flow	10^6 lb/hr	
8	73-80	9.5	Mass Steam each Generator	10^3 lb	
9	73-80	130.5	Mass Liquid each Generator	10^3 lb	
10	73-80	1106	Total Mass Secondary	10^3 lb	
11	37-44	112	Blowdown Rate	lb/hr	Blowdown not recycled to Secondary
	80	0	Blowdown Treatment		
12	73-80	0	Cond. Demin. Regen. Time	days	No Cond. Demin.
13	73-80	0	Fraction Cond. to Demin.		
14	73-80	513	Annual Ave. Dilution Flow	10^3 gpm	

In addition, site-specific information has been developed for atmospheric dispersion, transient and resident populations, recreational activities, food pathways, and any other parameter pertinent to the intents of this evaluation of UNIT No. 1's compliance with APPENDIX I. When required, these data are tabulated in the sections of this report that follow.

2.7 REFERENCES

1. United States Atomic Energy Commission, Directorate of Licensing, "The Final Environmental Statement Related to the ST. LUCIE PLANT, UNIT No. 1, Florida Power and Light Company," Washington, DC, June, 1973.

2. Constructed by DAMES and MOORE

3. R.L. Lyerly and DAMES and MOORE, "1973 ST. LUCIE, Florida Meteorological Summary, Prepared for Florida Power and Light Company," DAMES and MOORE Job No. 4595-044-27, May, 1975.

4. Private Communication from DAMES and MOORE, April 6, 1976.

5. pp. V-18 to V-23, United States Atomic Energy Commission, Directorate of Licensing, "The Final Environmental Statement Related to the ST. LUCIE PLANT, UNIT No. 1, Florida Power and Light Company," Washington, DC, June, 1973.

SECTION 3.0

DOSE DATA FOR "AS-BUILT" GASEOUS WASTE SYSTEM

3.0 DOSE DATA FOR "AS-BUILT" GASEOUS WASTE SYSTEM

3.1 INTRODUCTION

This section establishes individual and population dose data for ST. LUCIE PLANT UNIT No. 1's existing, or "as built", gaseous waste system. In order to determine these data, the following additional data inputs and information were developed:

a. A general description of each of the components of the "as-built" system;

b. Environmental pathways at or near the site by which a released radioactivity might make its way back to an individual or a population group have been developed. Extensive use of the guidelines given in the Staff's Regulatory Guide 1.109 has been made to aid in pathway development. When necessary, these guides have been supplemented with site-specific information in which clearly conservative assumptions have been selected to give further reliance to these pathway data, especially where the development of more detailed data would be difficult; and

c. Compliance conclusions can be developed from the dose data computed from a coupling of pathway data with the radioactive source terms of the plant's gaseous waste system.

3.2 GENERAL DESCRIPTION OF "AS-BUILT" GASEOUS WASTE SYSTEM

The gaseous radwaste system used at ST. LUCIE PLANT UNIT No. 1 processes the vent gases from equipment located in the chemical and volume control system, waste management system and fuel pool system, such that the radioactive gaseous release to the environs will be as low as practicable. The principal flow paths of the waste gas system are shown in FIGURE 3.2-1.

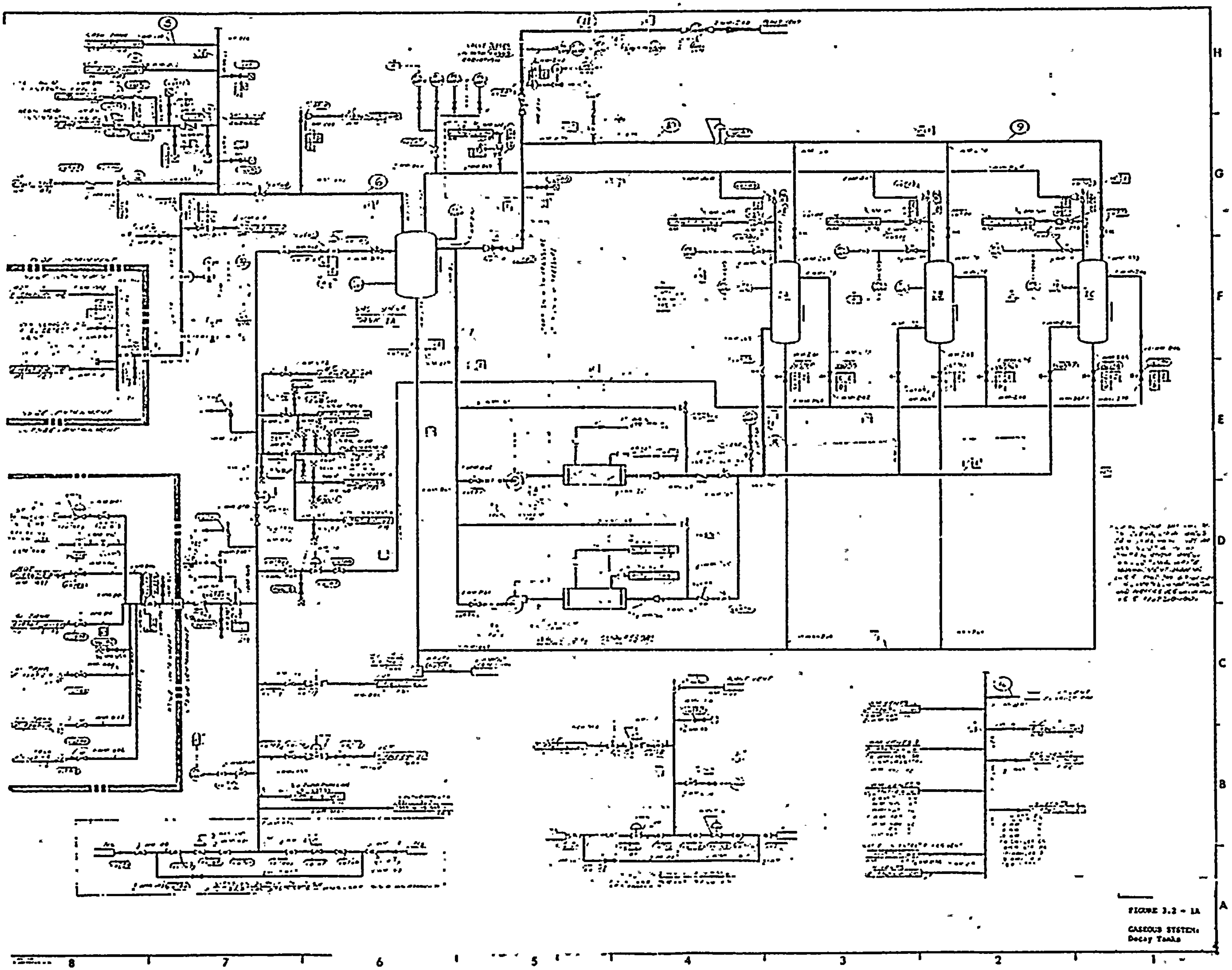


FIGURE 3.2 - 1A

GASEOUS SYSTEM:
Decay Tanks

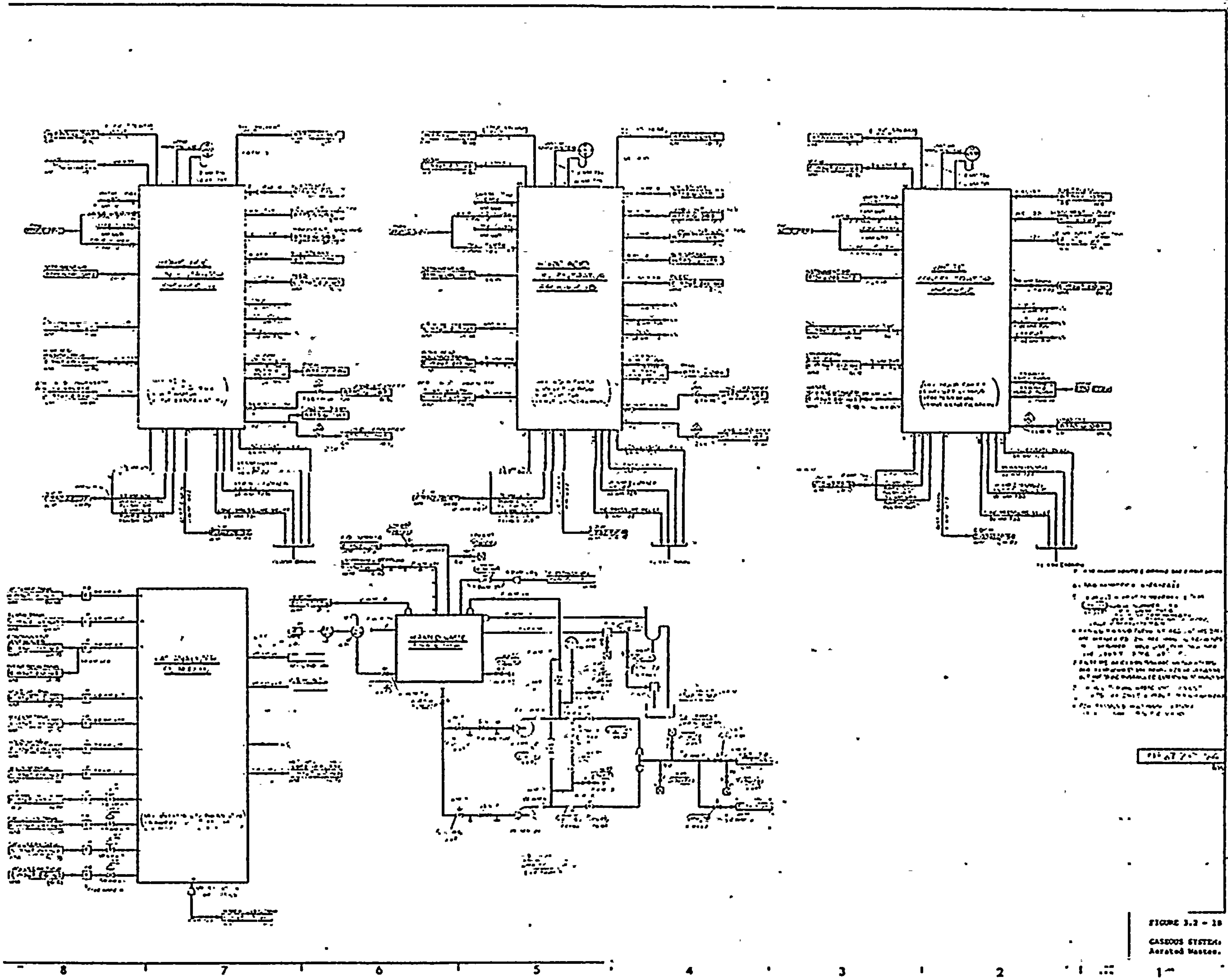


FIGURE 3.2 - 18

GASEOUS SYSTEM: Aerated Wastes.

Plant gaseous releases come from the reactor auxiliary building ventilation, turbine system leakage, steam jet air ejector operation, gland steam condenser operation and containment purging, in addition to releases from the gas collection header and gas surge header. Gland steam has the same activity as turbine steam. Releases from the reactor auxiliary building ventilation system are based on leakage of unprocessed reactor coolant at 120°F. Containment purging results in a constant release, regardless of percent failed fuel,since the airborne radioactivity removal system is operated for as long as necessary to keep activity levels as low as possible.

The waste gas system is designed on a batch mode basis for flexibility of operation. These batching operations proceed intermittently at faster flow rates than the annual average process rates and, therefore, the system components are sized accordingly. The waste gases are collected from the various source components by three headers: containment vent header, gas surge header, and gas collection header. The functions of these headers and their ancillary equipment can be described in this manner:

a. The Containment Vent Header: Receives hydrogenated and potentially radioactive gas mixtures vented from the reactor drain tank, quench tank, refueling failed-fuel detector vent, and reactor vessel head vent within the containment and directs the gases to the gas surge header.

b. The Gas Surge Header: In addition to the gases it receives from the containment vent header, the gas surge header receives hydrogenated and potentially radioactive gases vented from the volume control tank, flash tank, and boric acid concentrators in the reactor auxiliary building. The vented gases flow to a surge tank where they are collected prior to being compressed. Pressure instrumentation located on the surge tank controls tank volume; a level switch with a local alarm indicates to the operator when the tank should be emptied.

The pressure instrumentation on the surge tank also controls the compressors used to transfer the gas to the gas decay tanks. The gases flow from the gas surge tank to a compressor where they are compressed to 165 psig and cooled by an aftercooler prior to entering a gas decay tank where the gases are held up for radioactive decay.

There are three gas decay tanks, each of which are provided with local alarms and pressure and temperature indicators. The decay tanks have sufficient storage capacity (144 ft^3 each) for an average 30-day holdup. After the gaseous radioactivities have decayed to an acceptable level, consistent with the design objectives and verification by laboratory analysis, the gas is released to the environment via the plant vent at a controlled rate.

The system flow paths and release points of the gases from the gas decay tanks (and gas collection header) are indicated on FIGURE 3.1-1. The only flow bypass line in the waste gas system is also shown in this sketch. This flow path permits the flow of gases directly from the surge tank to the vent pipe by bypassing the waste gas compressor and gas decay tanks. This path is used when the air or nitrogen is purged from process equipment after initial plant startup or for maintenance operations. During these periods, essentially no activity will be present in the gas streams and it is unnecessary to route these gases to the gas decay tanks.

c. The Gas Collection Header: Collects the gases from primarily aerated vents of process equipment in the waste management system, chemical and volume control system, and fuel pool system. A listing of these sources are given in TABLE 3.2-1. Because of the large volume of gas and the low activity

TABLE 3.2-1

ST. LUCIE PLANT, UNIT No. 1

Gas Collection Header Source Points

Preconcentrator ion exchanger vent

Holdup tank vent

Boric acid condensate ion exchanger vent

Boric acid holding tank vent

Boric acid condensate tank vents

Waste ion exchanger

Equipment drain tank vent

Chemical drain tank vent

Laundry drain tank vents

Waste condensate tank vents

Spent resin tank vent

Waste concentrator vent

CVCS ion exchanger vents

Fuel pool system ion exchanger vent

Boric acid makeup tank vents

Charging pump vents

Charging pump seal lubrication tank vents

Boric acid makeup pump vents

level from these sources, the gases are routed directly to the vent pipe, which contains radioactivity monitors with alarms to indicate unexpected activity releases.

The hydrogen and nitrogen gas required for plant operations are also part of this system and redundant supply headers for each gas are provided. Hydrogen gas is supplied to the volume control tank space to maintain the desired concentration of reactor coolant dissolved hydrogen to suppress the net decomposition of water in the reactor. Nitrogen cover and/or purge gas is provided to the holdup tanks, quench tank, reactor drain tank, safety injection tanks, spent resin tank, and gas surge tank. Nitrogen is also supplied to the flash tank for degassing liquid waste and for periodic purges of the various waste management system and chemical and volume control system components.

The basic gaseous treatment system for ST. LUCIE PLANT UNIT No. 1 is shown in FIGURE 3.2-2 as a simplified schematic diagram for use as input information to the source terms developed later.

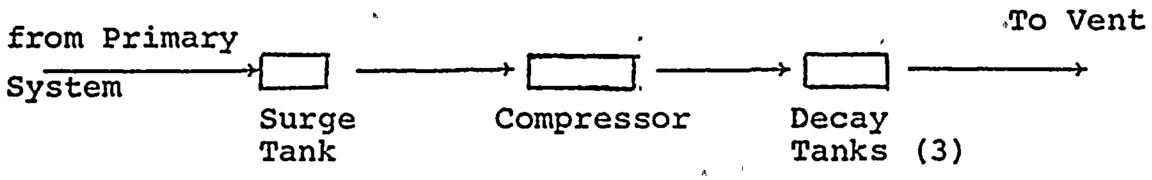
3.3 ESTIMATED RELEASES FROM SYSTEM

Gaseous releases based on the interim policy calculational methodology recommended in Section 11.3.6 of ST. LUCIE PLANT, UNIT No. 1's FSAR are provided in TABLE 3.3-1. The basic assumption is that this reactor will have a failed fuel rate of 0.25%. Over the operating lifetime of the reactor, it is expected that failed fuel rates of 0.1% will predominate. Thus, the average annual releases anticipated over the lifetime of the plant will be lower than those calculated (and used in this compliance case) by the ratio of the failed fuel rates (1.0/2.5). Likewise, releases during anticipated normal occurrences (1.0%) will be higher by the ratio of the failed rates (10.0/2.5).

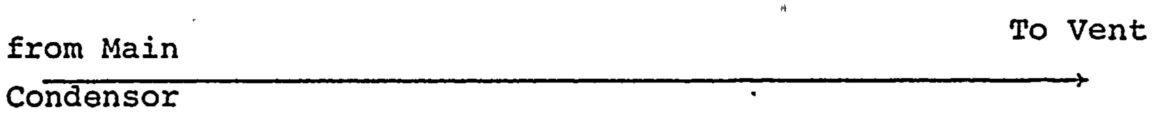
FIGURE 3.2-2

ST. LUCIE PLANT, UNIT No. 1: Schematic Diagram Of "As-Built" Gaseous Treatment System

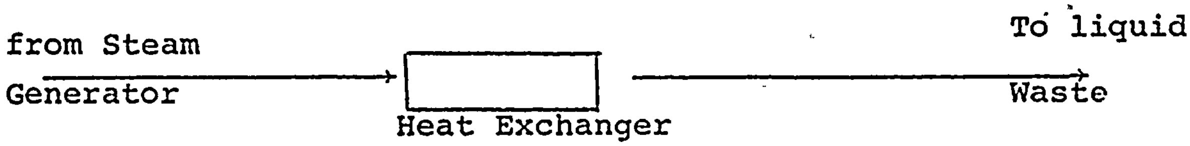
1. GAS DECAY SYSTEM



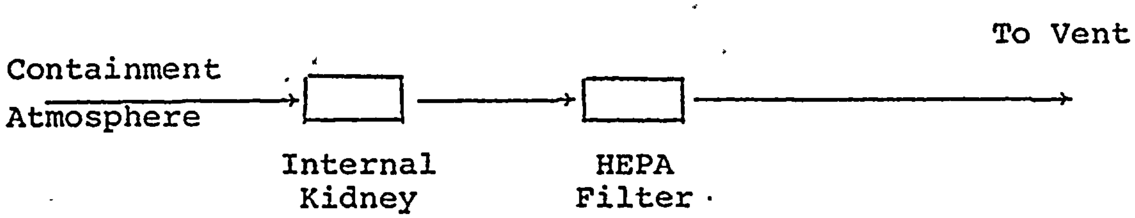
2. STEAM JET AIR EJECTOR



3. STEAM GENERATOR BLOWDOWN



4. CONTAINMENT PURGE



5. AUXILIARY BLDG. VENTILATION

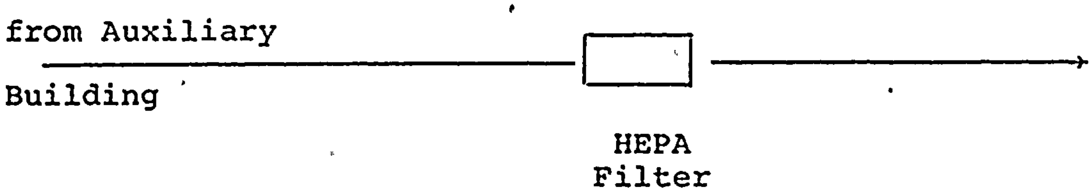


FIGURE 3.2-1 Cont.

6. <u>TURBINE BLDG. VENTILATION</u>

from Turbine Building → To Atmosphere

Non-cost-beneficial equipment not needed in the "as-built" system.

TABLE 3.3-1

ST. LUCIE PLANT, UNIT No.1: Estimated Gaseous Releases, Ci/sec*

(0.25% Failed Fuel)

Isotope	Gas Surge Header	Collection Header	Steam Generator Blowdown	Reactor Auxiliary Bldg. Vent	Turbine Bldg. Leakage From Secondary Syst.	Steam Jet Air Ejector	Contain-ment Purge	Turbine Steam Heating	Total Ci/sec.	Total Ci/yr.
Kr-85m	0	1.18(-7)	1.54(-10)	3.86(-7)	3.85(-11)	2.53(-7)	1.18(-8)	1.36(-12)	7.69(-7)	2.42(+1)
Kr-85	2.52(-5)**	3.84(-6)	1.54(-10)	2.29(-7)	2.29(-11)	1.51(-7)	3.22(-7)	8.10(-13)	2.97(-5)	9.36(+2)
Kr-87	0	2.46(-8)	8.26(-11)	2.10(-7)	2.07(-11)	1.36(-7)	4.22(-9)	7.31(-13)	3.75(-7)	1.18(+1)
Kr-88	0	1.52(-7)	2.66(-10)	6.75(-7)	6.69(-11)	4.41(-7)	2.72(-8)	2.37(-12)	1.30(-6)	4.10(+1)
Xe-131m	6.15(-6)	3.94(-6)	1.52(-10)	3.83(-7)	3.83(-11)	2.53(-7)	1.11(-7)	1.35(-12)	1.08(-5)	3.40(+2)
Xe-133	6.37(-6)	2.03(-4)	1.87(-8)	4.69(-5)	4.69(-9)	3.09(-5)	6.76(-6)	1.66(-10)	2.94(-4)	9.26(+3)
Xe-135	0	8.81(-7)	7.58(-10)	1.91(-6)	1.91(-10)	1.20(-6)	6.90(-8)	6.73(-12)	4.06(-6)	1.28(+2)
Xe-138	0	3.18(-9)	3.48(-11)	9.34(-8)	8.53(-12)	5.62(-8)	7.16(-10)	3.00(-13)	1.54(-7)	4.85(0)
I-129	2.69(-18)	1.64(-19)	1.22(-18)	9.35(-17)	3.06(-17)	1.01(-16)	4.10(-17)	1.08(-18)	2.71(-16)	8.56(-9)
I-131	1.03(-10)	3.15(-10)	5.88(-11)	5.15(-9)	1.48(-9)	4.87(-9)	2.26(-9)	5.22(-11)	1.43(-8)	4.51(-1)
I-132	0	2.51(-14)	1.36(-11)	1.41(-9)	3.42(-10)	1.13(-9)	4.72(-10)	1.21(-11)	3.38(-9)	1.06(-1)
I-133	0	4.41(-13)	4.12(-11)	7.34(-9)	1.04(-9)	3.40(-9)	3.14(-9)	3.66(-11)	1.50(-8)	4.73(-1)
I-134	0	5.84(-16)	3.21(-13)	8.04(-10)	8.02(-12)	2.65(-11)	2.20(-10)	2.83(-13)	1.06(-9)	3.33(-2)
I-135	0	1.45(-14)	8.93(-12)	3.51(-9)	2.24(-10)	7.39(-10)	1.42(-9)	7.89(-12)	5.91(-9)	1.87(-1)

* Activity values calculated at standard temperature and pressure.

** Numbers in ( ) are powers of ten.

3.4 INPUTS TO GALE CODE FOR SOURCE TERM CALCULATIONS

The gaseous emission source terms for the "as-built" system were calculated by the PWR-GALE code, using the data that appears in TABLES 2.6-1 and 3.3-1 and the parameters outlined in Regulatory Guide 1.BB. The input terms to the GALE Code that are required to describe the "as-built" gaseous radwaste system at UNIT No. 1 are shown in TABLE 3.4-1.

The resulting gaseous releases by isotope for the base system are shown in TABLE 3.4-2. Since two gaseous release points exist (the Plant Vent and Steam Jet Air Ejector), it was necessary to specify the release terms for each.

3.5 ENVIRONMENTAL INPUTS AND PATHWAYS

In order to convert the gaseous releases described in Section 3.3 above into either individual or population doses, it was necessary to emphasize these following environmental inputs:

3.5.1 Characteristics of Maximum Exposed Individual: In the calculation of doses to individuals maximumly exposed to the gaseous discharges from ST. LUCIE PLANT, UNIT No. 1, the usage factors given in TABLE A-2 of Regulatory Guide 1.109 were used. Doses to individuals have been calculated at these two points:

a. Nearest residence; located 1.9 miles (3,060 meters) WSW of site; and

TABLE 3.4-1

ST. LUCIE PLANT, UNIT No. 1: GALE Input Terms

For "As-Built" Gaseous Waste System

Card No.	Spaces	Entry	Item	Units	Comment
33	80	2	Letdown Stripping		From Vol. Control Tank
34	73-80	9.3	Holdup Time Xe	days	
35	73-80	9.3	Holdup Time Kr	days	
36	73-80	9.3	Collection Time	days	
37	39-41	*	Waste Gas Release		No HEPA
38	47-49	*	Aux Bldg Release		No Charcoal
	56-58	yes	Aux Bldg Release		HEPA
39	73-80	2.5	Containment Volume	10^6 cu ft	
40	73-80	20	Kidney Throughput	10^3 cfm	
41	47-49	*	High Vol. Purge		No Charcoal
	56-58	yes			HEPA
	78-80	48			No. per year
42	46-53	0	Low Vol. Purge	cfm	
	63-65	*			No Charcoal
	72-74	*			HEPA
43	73-80	0	Steam Gen. Blow-down Vent		Not vented to atmosphere
44	73-80	1	Condenser Air Ejector		No Charcoal

*Leave Blank

TABLE 3.4-2

ST. LUCIE PLANT, UNIT No. 1: Gaseous Releases For "As-Built" System

Nuclide	Release From (Curies/year) Plant Vent	Air Ejector	Total
Kr-83m	0	0	0
Kr-85m	5.0E 00	1.0E 00	6.0E 00
Kr-85	2.0E+02	0	2.0E+02
Kr-87	1.0E 00	0	1.0E 00
Kr-88	7.0E 00	2.0E 00	9.0E 00
Kr-89	0	0	0
Xe-131m	2.1E+02	0	2.1E+02
Xe-133m	7.8E+01	1.0E 00	7.9E+01
Xe-133	2.3E+04	8.0E+01	2.3E+04
Xe-135m	0	0	0
Xe-135	2.4E+01	4.0E 00	2.8E+01
Xe-137	0	0	0
Xe-138	0	0	0
A-41	2.5E+01	0	2.5E+01
C-14	8.0E 00	0	8.0E 00
I-131	6.87E-02	3.9E-02	1.1E-01
I-133	7.89E-02	4.6E-02	1.2E-01
Mn-54	4.7E-03	0	4.7E-03
Fe-59	1.6E-03	0	1.6E-03
Co-58	1.6E-02	0	1.6E-02
Co-60	7.3E-03	0	7.3E-03
Sr-89	3.4E-04	0	3.4E-04
Sr-90	6.2E-05	0	6.2E-05
Cs-134	4.7E-03	0	4.7E-03
Cs-137	7.8E-03	0	7.8E-03
H-3	4.16E+02	1.54E+02	5.7E+02

b. Nearest milk-producing animal; located 7.5 miles (12,000 meters) SSW of site.

3.5.2 Atmospheric Dispersion Data: The atmospheric dispersion available at a reactor site is one of the most important factors governing potential doses to individuals and to populations from the release of gaseous radionuclides by a reactor. The specific characteristics of atmospheric dispersion for the ST. LUCIE PLANT have been developed through the use of the computations described in Paragraph 2.5.2 above and the calculational models specified in Paragraph 2.4 above. These characteristics also have been evaluated using the techniques outlined in Regulatory Guide 1.111.

TABLE 3.5.2-1 presents a summary of the annual wind frequency distributions at the ST. LUCIE PLANT site. The calculated values for dispersion (χ/Q in sec/m^3), depleted dispersion ($[\chi/Q]^1$ in sec/m^3), and specific deposition (d in 1/m^2) for plant vent and turbine building/steam jet air ejector releases, respectively, are given in TABLES 3.5.2-2 through 3.5.2-7. These two release sources are treated separately, since the plant vent is a partially elevated release, whereas the turbine building/SJAE are essentially ground level releases.

These dispersion data were averaged for the 16 cardinal directions around ST. LUCIE PLANT in order to calculate

TABLE 3.5.2-1

ST. LUCIE PLANT SITE: Annual Wind Report -

Wind Frequency Distribution (In Percent)*

Wind Sector	1-3	4-7	8-12	13-18	19-24	25-31	31+	Total %	Av. Speed M.P.H.
	Wind Speed Classes in M.P.H.								
NNE	0.71	1.63	0.99	0.08	0.00	0.00	0.00	3.40	6.21
NE	0.49	2.67	2.42	0.88	0.00	0.00	0.00	6.46	8.13
ENE	0.41	2.65	2.43	0.54	0.00	0.00	0.00	6.03	7.69
E	0.73	4.17	4.03	1.00	0.00	0.00	0.00	9.94	7.92
ESE	0.85	4.44	4.41	0.49	0.00	0.00	0.00	10.19	7.56
SE	0.72	3.51	5.27	0.60	0.00	0.00	0.00	10.10	8.09
SSE	0.42	2.43	3.43	1.26	0.06	0.00	0.00	7.60	8.85
S	0.57	2.61	2.84	0.64	0.01	0.00	0.00	6.68	7.95
SSW	0.49	2.52	2.17	0.49	0.08	0.00	0.00	5.75	7.72
SW	0.50	2.76	1.35	0.31	0.05	0.00	0.00	4.97	6.97
WSW	0.58	2.04	0.37	0.09	0.00	0.00	0.00	3.08	5.46
W	0.93	1.80	0.37	0.06	0.00	0.00	0.00	3.15	5.04

TABLE 3.5.2-1 (cont'd.)

Wind Sector	1-3	4-7	8-12	13-18	19-24	25-31	31+	Total %	Av. Speed M.P.H.
WNW	0.93	2.44	1.38	0.25	0.00	0.00	0.00	5.00	6.39
NW	0.63	3.98	2.27	0.32	0.00	0.00	0.00	7.20	6.93
NNW	0.34	2.02	1.57	0.09	0.00	0.00	0.00	4.02	6.97
N	0.34	1.51	2.83	0.36	0.00	0.00	0.00	5.04	8.27
TOTALS (%)	9.67	43.18	38.12	7.46	0.19	0.00	0.00	98.64	7.26 mph

NOTES:

*) Based on valid observations at the 50-foot elevation for the period 01/01/73 to 12/31/73

a) No. of valid observations 8,724

b) No. of invalid observations 36

TABLE 3.5.2-2

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Plant Vent (Period of Record: 3-01-71 to 12-31-73).

I. Average Annual Relative Concentration; χ/Q, sec/m^3

	Base Distance Miles:	0.50	1.50	2.50	3.50	4.50	5.50	6.50	7.50
Sector	Av. Wind Speed m/sec	Kilometers: 0.80	2.41	4.02	5.63	7.25	8.85	10.46	12.07
NNE	3.185	9.1E-06	9.6E-07	3.5E-07	1.9E-07	1.3E-07	9.2E-08	7.2E-08	5.9E-08
NE	3.037	9.7E-06	1.0E-06	3.7E-07	2.0E-07	1.4E-07	9.9E-08	7.7E-08	6.3E-08
ENE	2.636	7.6E-06	8.1E-07	2.9E-07	1.6E-07	1.1E-07	7.9E-08	6.2E-08	5.1E-08
E	2.205	7.6E-06	8.0E-07	2.9E-07	1.6E-07	1.1E-07	7.8E-08	6.2E-08	5.1E-08
ESE	2.526	9.8E-06	1.0E-06	3.7E-07	2.0E-07	1.3E-07	9.9E-08	7.8E-08	6.4E-08
SE	2.979	1.0E-06	1.1E-06	3.8E-07	2.1E-07	1.4E-07	1.0E-07	8.0E-08	6.6E-08
SSE	3.005	5.5E-06	5.8E-07	2.1E-07	1.1E-07	7.6E-08	5.5E-08	4.3E-08	3.5E-08
S	3.902	4.6E-06	4.8E-07	1.7E-07	9.5E-08	6.3E-08	4.6E-08	3.6E-08	3.0E-08
SSW	3.243	4.1E-06	4.5E-07	1.6E-07	8.9E-08	5.8E-08	4.2E-08	3.3E-08	2.7E-08
SW	3.463	4.9E-06	5.3E-07	1.9E-07	1.0E-07	6.7E-08	4.9E-08	3.8E-08	3.1E-08
WSW	3.310	5.8E-06	6.3E-07	2.2E-07	1.2E-07	7.9E-08	5.8E-08	4.5E-08	3.7E-08
W	3.308	7.0E-06	7.7E-07	2.7E-07	1.5E-07	9.7E-08	7.1E-08	5.5E-08	4.5E-08
WNW	3.029	9.0E-06	9.9E-07	3.5E-07	1.9E-07	1.3E-07	9.2E-08	7.1E-08	5.8E-08
NW	3.254	9.1E-06	1.0E-06	3.6E-07	2.0E-07	1.3E-07	9.6E-08	7.5E-08	6.1E-08
NNW	3.232	8.1E-06	9.0E-07	3.2E-07	1.8E-07	1.2E-07	8.4E-08	6.6E-08	5.4E-08
N	3.174	7.9E-06	8.6E-07	3.1E-07	1.7E-07	1.1E-07	7.9E-08	6.2E-08	5.0E-08

χ/Q, sec/m^3

Sector	Av. Wind Speed m/sec	Base Distance Miles: 8.58 / Kilometers: 13.68	10.00 / 16.09	15.00 / 24.14	25.01 / 40.23	35.01 / 56.33	45.01 / 72.42	1.00 / 1.61	1.90 / 3.06
NNE	3.185	4.7E-08	3.8E-08	2.3E-08	1.2E-08	7.8E-09	5.8E-09	2.4E-06	5.9E-07
NE	3.037	5.1E-08	4.1E-08	2.4E-08	1.3E-08	8.4E-09	6.2E-09	2.6E-06	6.3E-07
ENE	2.636	4.1E-08	3.3E-08	2.0E-08	1.0E-08	6.8E-09	5.0E-09	2.0E-06	5.0E-07
E	2.205	4.1E-08	3.3E-08	2.0E-08	1.0E-08	6.9E-09	5.1E-09	2.0E-06	4.9E-07
ESE	2.526	5.1E-08	4.2E-08	2.5E-08	1.3E-08	8.8E-09	6.5E-09	2.5E-06	6.1E-07
SE	2.979	5.3E-08	4.3E-08	2.5E-08	1.3E-08	9.0E-09	6.6E-09	2.7E-06	6.4E-07
SSE	3.005	2.8E-08	2.3E-08	1.4E-08	7.2E-09	4.8E-09	3.5E-09	1.4E-06	3.5E-07
S	3.902	2.3E-08	1.9E-08	1.1E-08	5.9E-09	3.9E-09	2.9E-09	1.2E-06	2.9E-07
SSW	3.243	2.2E-08	1.7E-08	1.0E-08	5.4E-09	3.5E-09	2.6E-09	1.1E-06	2.7E-07
SW	3.463	2.5E-08	2.0E-08	1.2E-08	6.1E-09	4.0E-09	3.0E-09	1.3E-06	3.2E-07
WSW	3.310	2.9E-08	2.3E-08	1.4E-08	7.1E-09	4.7E-09	3.4E-09	1.6E-06	3.8E-07
W	3.308	3.6E-08	2.9E-08	1.7E-08	8.8E-09	5.8E-09	4.3E-09	1.9E-06	4.7E-07
WNW	3.029	4.6E-08	3.7E-08	2.2E-08	1.2E-08	7.6E-09	5.6E-09	2.4E-06	6.0E-07
NW	3.254	4.8E-08	3.9E-08	2.3E-08	1.2E-08	7.9E-09	5.8E-09	2.4E-06	6.1E-07
NNW	3.232	4.3E-08	3.5E-08	2.0E-08	1.1E-08	7.0E-09	5.1E-09	2.2E-06	5.5E-07
N	3.174	4.0E-08	3.3E-08	1.9E-08	1.0E-08	6.6E-09	4.8E-09	2.1E-06	5.2E-07

TABLE 3.5.2-3

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Plant Vent (Period of Record: 3-01-71 to 12-31-73).

II. Average Annual Relative Concentration, Depleted; $[\frac{X}{Q}]^1$, sec/m^3

Sector	Base Distance Miles: 0.50	1.50	2.50	3.50	4.50	5.50	6.50	7.58
	Kilometers 0.80	2.41	4.02	5.68	7.24	8.85	10.46	12.07
NNE	8.1E-06	8.0E-07	2.8E-07	1.5E-07	9.4E-08	6.8E-08	5.2E-08	4.2E-08
NE	8.7E-06	8.7E-07	3.0E-07	1.6E-07	1.0E-07	7.5E-08	5.8E-08	4.7E-08
ENE	6.7E-06	6.7E-07	2.3E-07	1.3E-07	8.1E-08	5.8E-08	4.5E-08	3.6E-08
E	6.7E-06	6.5E-07	2.3E-07	1.2E-07	7.9E-08	5.7E-08	4.4E-08	3.5E-08
ESE	8.7E-06	8.3E-07	2.9E-07	1.5E-07	1.0E-07	7.2E-08	5.6E-08	4.5E-08
SE	9.3E-06	9.0E-07	3.1E-07	1.7E-07	1.1E-07	7.8E-08	6.0E-08	4.9E-08
SSE	4.9E-06	4.8E-07	1.7E-07	8.9E-08	5.7E-08	4.1E-08	3.2E-08	2.6E-08
S	4.1E-06	3.9E-07	1.4E-07	7.2E-08	4.7E-08	3.4E-08	2.6E-08	2.1E-08
SSW	3.6E-06	3.7E-07	1.3E-07	6.8E-08	4.4E-08	3.1E-08	2.4E-08	1.9E-08
SW	4.4E-06	4.4E-07	1.5E-07	8.0E-08	5.1E-08	3.7E-08	2.8E-08	2.2E-08
WSW	5.3E-06	5.4E-07	1.8E-07	9.8E-08	6.3E-08	4.5E-08	3.4E-08	2.8E-08
W	6.4E-06	6.5E-07	2.2E-07	1.2E-07	7.7E-08	5.5E-08	4.2E-08	3.4E-08
WNW	8.2E-06	8.5E-07	2.9E-07	1.6E-07	1.0E-07	7.2E-08	5.6E-08	4.5E-08
NW	8.3E-06	8.6E-07	3.0E-07	1.6E-07	1.0E-07	7.6E-08	5.8E-08	4.7E-08
NNW	7.4E-06	7.7E-07	2.7E-07	1.4E-07	9.2E-08	6.6E-08	5.1E-08	4.1E-08
N	7.2E-06	7.3E-07	2.5E-07	1.3E-07	8.5E-08	6.1E-08	4.7E-08	3.8E-08

$[\frac{X}{Q}]^1$, sec/m^3

Sector	Base Distance Miles: 8.5 / Kilometers: 13.68	10.00 / 16.09	15.00 / 24.14	25.01 / 40.23	35.01 / 56.33	45.01 / 72.42	1.00 / 1.61	1.90 / 3.06
NNE	3.3E-08	2.6E-08	1.5E-08	7.2E-09	4.5E-09	3.2E-09	2.0E-06	4.8E-07
NE	3.7E-08	2.9E-08	1.7E-08	8.2E-09	5.1E-09	3.6E-09	2.2E-06	5.2E-07
ENE	2.9E-08	2.3E-08	1.3E-08	6.4E-09	4.0E-09	2.9E-09	1.7E-06	4.0E-07
E	2.8E-08	2.2E-08	1.3E-08	6.2E-09	3.9E-09	2.8E-09	1.6E-06	3.9E-07
ESE	3.6E-08	2.8E-08	1.6E-08	8.0E-09	5.0E-09	3.6E-09	2.1E-06	5.0E-07
SE	3.9E-08	3.1E-08	1.8E-08	8.7E-09	5.5E-09	3.9E-09	2.3E-06	5.4E-07
SSE	2.0E-08	1.6E-08	9.1E-09	4.5E-09	2.8E-09	2.0E-09	1.2E-06	2.9E-07
S	1.6E-08	1.3E-08	7.2E-09	3.5E-09	2.2E-09	1.6E-09	1.0E-06	2.4E-07
SSW	1.5E-08	1.2E-08	6.7E-09	3.3E-09	2.0E-09	1.4E-09	9.2E-07	2.2E-07
SW	1.8E-08	1.4E-08	7.8E-09	3.8E-09	2.3E-09	1.7E-09	1.1E-06	2.6E-07
WSW	2.2E-08	1.7E-06	9.6E-09	4.7E-09	2.9E-09	2.1E-09	1.4E-06	3.2E-07
W	2.6E-08	2.1E-08	1.2E-08	5.7E-09	3.6E-09	2.5E-09	1.6E-06	3.9E-07
WNW	3.5E-08	2.8E-08	1.6E-08	7.8E-09	4.9E-09	3.5E-09	2.1E-06	5.1E-07
NW	3.6E-08	2.9E-08	1.7E-08	8.2E-09	5.2E-09	3.7E-09	2.1E-06	5.2E-07
NNW	3.2E-08	2.6E-08	1.5E-08	7.2E-09	4.6E-09	3.3E-09	1.9E-06	4.7E-07
N	3.0E-08	2.4E-08	1.3E-08	6.6E-09	4.2E-09	3.0E-09	1.8E-06	4.4E-07

TABLE 3.5.2-4

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Plant Vent (Period of Record: 3-01-71 to 12-31-73)

III. Average Annual Relative Deposition Rate, D/Q, $^1/m^2$

Sector	Av. Wind Speed \ Distance	Miles: 0.50	1.50	2.50	3.50	4.50	5.50	6.50	7.50
		Kilometers: 0.80	2.41	4.02	5.63	7.24	8.85	10.46	12.07
NNE		8.4E-09	1.4E-09	5.9E-10	3.3E-10	2.1E-10	1.5E-10	1.1E-10	8.4E-11
NE		8.4E-09	1.4E-09	5.9E-10	3.3E-10	2.1E-10	1.5E-10	1.1E-10	8.4E-11
ENE		5.1E-09	8.5E-10	3.5E-10	1.9E-10	1.2E-10	8.7E-11	6.5E-11	5.0E-11
E		3.0E-09	5.1E-10	2.1E-10	1.2E-10	7.6E-11	5.4E-11	4.0E-11	3.1E-11
ESE		4.3E-09	7.3E-10	3.0E-10	1.7E-10	1.1E-10	7.6E-11	5.6E-11	4.4E-11
SE		6.2E-09	1.0E-09	4.3E-10	2.4E-10	1.5E-10	1.1E-10	8.1E-11	6.3E-11
SSE		5.4E-09	8.7E-10	3.6E-10	2.0E-10	1.3E-10	9.0E-11	6.7E-11	5.2E-11
S		9.0E-09	1.4E-09	5.6E-10	3.1E-10	2.0E-10	1.4E-10	1.0E-10	7.9E-11
SSW		7.2E-09	1.2E-09	4.8E-10	2.6E-10	1.7E-10	1.2E-10	8.9E-11	6.9E-11
SW		1.2E-08	1.8E-09	7.4E-10	4.1E-10	2.6E-10	1.9E-10	1.4E.10	1.1E-10
WSW		1.3E-08	2.1E-09	8.5E-10	4.7E-10	3.0E-10	2.1E-10	1.6E-10	1.2E-10
W		1.9E-08	3.0E-09	1.2E-09	6.8E-10	4.4E-10	3.1E-10	2.3E-10	1.8E-10
WNW		1.5E-08	2.3E-09	9.5E-10	5.3E-10	3.4E-10	2.4E-10	1.8E-10	1.4E-10
NW		1.7E-08	2.6E-09	1.0E-09	5.8E-10	3.7E-10	2.6E-10	1.9E-10	1.5E-10
NNW		1.0E-08	1.6E-09	6.3E-10	3.5E-10	2.2E-10	1.6E-10	1.2E-10	8.9E-11
N		8.9E-09	1.4E-09	5.9E-10	3.3E-10	2.1E-10	1.5E-10	1.1E-10	8.4E-11

TABLE 3.5.2-4

D/Q, $^1/_{m^2}$

Sector	Av. Wind Speed \ Distance	Miles: 8.50 Kilometers: 13.68	10.00 16.09	15.00 24.14	25.01 40.23	35.01 56.33	45.01 72.42	1.00 1.61	1.90 3.06
NNE		6.7E-11	5.0E-11	2.4E-11	9.3E-12	4.9E-12	3.8E-12	2.8E-09	9.5E-10
NE		6.7E-11	5.0E-11	2.4E-11	9.6E-12	5.1E-12	3.2E-12	2.8E-09	9.4E-10
ENE		4.0E-11	3.0E-11	1.5E-11	5.8E-12	3.1E-12	1.9E-12	1.7E-09	5.6E-10
E		2.5E-11	1.9E-11	9.2E-11	3.7E-12	2.0E-12	1.2E-12	1.0E-09	3.4E-10
ESE		3.5E-11	2.6E-11	1.3E-11	5.1E-12	2.7E-12	1.7E-12	1.4E-09	4.9E-10
SE		5.0E-11	3.8E-11	1.8E-11	7.3E-12	4.0E-12	2.5E-12	2.0E-09	6.9E-10
SSE		4.1E-11	3.1E-11	1.5E-11	6.0E-12	3.2E-12	2.0E-12	1.7E-09	5.8E-10
S		6.3E-11	4.7E-11	2.3E-11	8.9E-12	4.7E-12	2.8E-12	2.8E-09	9.1E-09
SSW		5.5E-11	4.2E-11	2.0E-11	8.2E-12	4.4E-12	2.7E-12	2.3E-09	7.7E-10
SW		8.8E-11	6.6E-11	3.3E-11	1.4E-11	7.32E-12	4.5E-12	3.7E-09	1.2E-09
WSW		1.0E-10	7.5E-11	3.8E-11	1.5E-11	8.4E-12	5.2E-12	4.2E-09	1.4E-09
W		1.5E-10	1.1E-10	5.5E-11	2.3E-11	1.2E-11	7.7E-12	6.1E-09	2.0E-09
WNW		1.1E-10	8.4E-11	4.2E-11	1.7E-11	9.2E-12	5.7E-12	4.7E-09	1.5E-09
NW		1.2E-10	9.0E-11	4.4E-11	1.8E-11	9.4E-12	5.8E-12	5.2E-09	1.7E-09
NNW		7.1E-11	5.3E-11	2.6E-11	1.0E-11	5.26-12	3.2E-12	3.1E-09	1.0E.09
N		6.7E-11	5.0E-11	2.4E-11	9.2E-12	4.9E-12	3.0E-12	2.9E-09	9.6E-09

TABLE 3.5.2-5

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Steam Jet and Turbine Building Vent (Period of Record: 3-1-71 to 12-31-73)

I. Average Annual Relative Concentration, χ/Q, sec/m^3

Sector	Miles: 0.50 / Kilometers: 0.80	1.50 / 2.41	2.50 / 4.02	3.50 / 5.63	4.50 / 7.24	5.50 / 8.85	6.50 / 10.64	7.50 / 12.07
NNE	1.4 E-05	1.4E-06	4.8E-07	2.6E-07	1.7E-07	1.2E-07	9.5E-08	7.7E-08
NE	1.5 E-05	1.5E-06	5.3E-07	2.8E-07	1.8E-07	1.3E-07	1.0E-07	8.4E-08
ENE	1.2 E-05	1.2E-06	4.4E-07	2.3E-07	1.5E-07	1.1E-07	8.5E-07	6.9E-07
E	1.2 E-05	1.2E-06	4.3E-07	2.3E-07	1.5E-07	1.1E-07	8.5E-08	6.9E-08
ESE	1.5 E-05	1.5E-06	5.2E-07	2.8E-07	1.8E-07	1.3E-07	1.0E-07	8.5E-08
SE	1.5 E-05	1.5E-06	5.2E-07	2.8E-07	1.9E-07	1.3E-07	1.0E-07	8.5E-08
SSE	8.2 E-06	8.3E-07	2.9E-07	1.6E-07	1.0E-07	7.4E-08	5.7E-08	4.6E-08
S	6.9 E-06	7.0E-07	2.4E-07	1.3E-07	8.4E-08	6.1E-08	4.7E-08	3.8E-08
SSW	6.5 E-06	6.6E-07	2.3E-07	1.2E-07	7.9E-08	5.7E-08	4.4E-08	3.6E-08
SW	7.3 E-06	7.5E-07	2.6E-07	1.4E-07	8.8E-08	6.3E-08	4.9E-08	3.9E-08
WSW	8.5 E-06	8.7E-07	3.0E-07	1.6E-07	1.0E-07	7.2E-08	5.6E-08	4.5E-08
W	1.0 E-05	1.1E-06	3.6E-07	1.9E-07	1.2E-07	8.9E-08	6.9E-08	5.6E-08
WNW	1.3 E-05	1.4E-06	4.8E-07	2.5E-07	1.6E-07	1.2E-07	9.1E-08	7.4E-08
NW	1.3 E-05	1.4E-06	5.0E-07	2.6E-07	1.7E-07	1.2E-07	9.5E-08	7.7E-08
NNW	1.2 E-05	1.3E-06	4.5E-07	2.4E-07	1.5E-07	1.1E-07	8.5E-08	6.9E-08
N	1.1 E-05	1.2E-06	4.1E-07	2.2E-07	1.4E-07	1.0E-07	7.9E-08	6.4E-08

Table 3.5.2-5, cont'd

TABLE 3.5.2-5

Sector	Miles: 8.50 Kilometers: 13.68	10.00 16.09	15.00 24.14	25.01 40.23	35.01 56.33	45.01 72.42	1.00 1.61	1.90 3.06
NNE	6.1E-08	4.9E-08	2.9E-08	1.5E-08	9.8E-09	7.2E-09	3.5E-06	8.3E-07
NE	6.7E-08	5.4E-08	3.1E-08	1.6E-08	1.1E-08	7.8E-09	3.9E-06	9.2E-07
ENE	5.5E-08	4.4E-08	2.6E-08	1.3E-08	8.7E-09	6.4E-09	3.1E-06	7.5E-07
E	5.5E-08	4.5E-08	2.6E-08	1.4E-08	8.9E-09	6.6E-09	3.1E-06	7.4E-07
ESE	6.8E-08	5.5E-08	3.2E-08	1.7E-08	1.1E-08	8.2E-09	3.7E-06	8.9E-07
SE	6.8E-08	5.5E-08	3.2E-08	1.7E-08	1.1E-08	8.2E-09	3.8E-06	9.0E-07
SSE	3.7E-08	3.0E-08	1.7E-08	9.8E-09	5.9E-09	4.4E-09	2.1E-06	5.0E-07
S	3.1E-08	2.5E-08	1.4E-08	7.5E-09	4.9E-09	3.6E-09	1.8E-06	4.2E-07
SSW	2.8E-08	2.3E-08	1.3E-08	6.8E-09	4.4E-09	3.3E-09	1.7E-06	4.0E-07
SW	3.1E-08	2.5E-08	1.5E-08	7.5E-09	4.9E-09	3.6E-09	1.9E-06	4.5E-07
WSW	3.6E-08	2.9E-08	1.7E-08	8.6E-09	5.6E-09	4.1E-09	2.2E-06	5.2E-07
W	4.4E-08	3.6E-08	2.1E-08	1.1E-08	6.9E-09	5.1E-09	2.7E-06	6.4E-07
WNW	5.9E-08	4.7E-08	2.7E-08	1.4E-08	9.2E-09	6.8E-09	3.5E-06	8.3E-07
NW	6.1E-08	4.9E-08	2.9E-08	1.5E-08	9.6E-09	7.1E-09	3.6E-06	8.6E-07
NNW	5.5E-08	4.4E-08	2.5E-08	1.3E-08	8.5E-09	6.3E-09	3.2E-06	7.8E-07
N	5.1E-08	4.1E-08	2.4E-08	1.2E-08	8.0E-09	5.9E-09	3.0E-06	7.1E-07

TABLE 3.5.2-6

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Steam Jet and Turbine Building Vent (Period of Record: 3-1-71 to 12-31-73)

II. Average Annual Relative Concentration, Depleted, $[\chi/Q]^1$, sec/m^3

Sector	Miles: 0.50 Kilometers: 0.80	1.50 2.41	2.50 4.02	3.50 5.63	4.50 7.24	5.50 8.85	6.50 10.46	7.50 12.07
NNE	1.2E-05	1.0E-06	3.4E-07	1.7E-07	1.1E-07	7.5E-08	5.6E-08	4.5E-08
NE	1.3E-05	1.2E-06	3.7E-07	1.9E-07	1.2E-07	8.2E-08	6.1E-08	4.8E-08
ENE	1.0E-05	9.4E-07	3.1E-07	1.6E-07	9.7E-08	6.7E-08	5.1E-08	4.0E-08
E	1.0E-05	9.3E-07	3.0E-07	1.6E-07	9.7E-08	6.8E-08	5.1E-08	4.0E-08
ESE	1.3E-05	1.1E-06	3.7E-07	1.9E-07	1.2E-07	8.3E-08	6.2E-08	4.9E-08
SE	1.3E-05	1.1E-06	3.7E-07	1.9E-07	1.2E-07	8.3E-08	6.3E-08	4.9E-08
SSE	7.0E-06	6.3E-07	2.1E-07	1.0E-07	6.5E-08	4.5E-08	3.4E-08	2.7E-08
S	5.9E-06	5.3E-07	1.7E-07	8.7E-08	5.4E-08	3.8E-08	2.8E-08	2.2E-08
SSW	5.5E-06	5.0E-07	1.6E-07	8.2E-08	5.0E-08	3.5E-08	2.6E-08	2.1E-08
SW	6.2E-06	5.7E-07	1.8E-07	9.1E-08	5.6E-08	3.9E-08	2.9E-08	2.3E-08
WSW	7.2E-06	6.6E-07	2.1E-07	1.0E-07	6.5E-08	4.5E-08	3.3E-08	2.6E-08
W	8.7E-06	8.0E-07	2.6E-07	1.3E-07	7.9E-08	5.5E-08	4.1E-08	3.2E-08
WNW	1.1E-05	1.0E-06	3.4E-07	1.7E-07	1.0E-07	7.3E-08	5.4E-08	4.3E-08
NW	1.1E-05	1.1E-06	3.5E-07	1.8E-07	1.1E-07	7.6E-08	5.7E-08	4.4E-08
NNW	1.0E-05	9.7E-06	3.1E-07	1.6E-07	9.8E-08	6.8E-08	5.1E-08	4.0E-08
N	9.7E-06	9.0E-06	2.9E-07	1.5E-07	9.1E-08	6.3E-08	4.7E-08	3.7E-08

Table 3.5.2-6 cont'd

TABLE 3.5.2-6

Sector	Miles: 8.50 / Kilometers: 13.68	10.00 / 16.09	15.00 / 24.14	25.01 / 40.23	35.01 / 56.33	45.01 / 72.42	1.00 / 1.61	1.90 / 3.06
NNE	3.5E-08	2.7E-08	1.4E-08	6.2E-09	3.6E-09	2.4E-09	2.8E-06	6.1E-07
NE	3.8E-08	2.9E-08	1.5E-08	6.7E-09	3.9E-09	2.5E-09	3.1E-06	6.7E-07
ENE	3.1E-08	2.4E-08	1.3E-08	5.5E-09	3.2E-09	2.1E-09	2.5E-06	5.5E-07
E	3.1E-08	2.4E-08	1.3E-08	5.7E-09	3.3E-09	2.2E-09	2.4E-06	5.4E-07
ESE	3.9E-08	3.0E-08	1.6E-08	7.1E-09	4.1E-09	2.7E-09	3.0E-06	6.5E-07
SE	3.9E-08	3.0E-08	1.6E-08	7.0E-09	4.1E-09	2.7E-09	3.0E-06	6.6E-07
SSE	2.1E-08	1.6E-08	8.5E-09	3.8E-09	2.2E-09	1.4E-09	1.7E-06	3.7E-07
S	1.7E-08	1.3E-08	7.1E-09	3.1E-09	1.8E-09	1.2E-09	1.4E-06	3.1E-07
SSW	1.6E-08	1.2E-08	6.4E-09	2.8E-09	1.6E-09	1.1E-09	1.3E-06	2.9E-07
SW	1.8E-08	1.4E-08	7.1E-09	3.1E-09	1.8E-09	1.2E-09	1.5E-06	3.3E-07
WSW	2.0E-08	1.6E-08	8.2E-09	3.6E-09	2.1E-09	1.3E-09	1.7E-06	3.8E-07
W	2.5E-08	1.9E-08	1.0E-08	4.4E-09	2.5E-09	1.7E-09	2.1E-06	4.7E-07
WNW	3.3E-08	2.6E-08	1.3E-08	5.9E-09	3.4E-09	2.2E-09	2.8E-06	6.1E-07
NW	3.5E-08	2.7E-08	1.4E-08	6.1E-09	3.5E-09	2.3E-09	2.8E-06	6.3E-07
NNW	3.1E-08	2.4E-08	1.2E-08	5.4E-09	3.1E-08	2.0E-09	2.5E-06	5.7E-07
N	2.9E-08	2.2E-08	1.2E-08	5.1E-09	2.9E-09	1.9E-09	2.4E-06	5.2E-07

TABLE 3.5.2-7

ST. LUCIE PLANT: Average Annual Atmospheric Dispersion Discharges From Steam Jet and Turbine Building Vent (Period of Record: 3-01-71 to 12-31-73)

III. Average Annual Deposition Rate, d/Q, 1/m^2

Sector	Miles: 0.50 Kilometers: 0.80	1.50 2.41	2.50 4.02	3.50 5.63	4.50 7.24	5.50 8.85	6.50 10.46	7.50 12.07
NNE	1.8E-08	2.5E-09	9.9E-10	5.4E-10	3.4E-10	2.4E-10	1.8E-10	1.4E-10
NE	2.0E-08	2.8E-09	1.1E-09	6.0E-10	3.8E-10	2.6E-10	2.0E-10	1.5E-10
ENE	1.3E-08	1.8E-09	7.2E-10	3.9E-10	2.5E-10	1.7E-10	1.3E-10	9.9E-11
E	9.7E-09	1.4E-09	5.3E-10	2.9E-10	1.8E-10	1.3E-10	9.4E-10	7.3E-11
ESE	1.3E-08	1.8E-09	7.1E-10	3.8E-10	2.4E-10	1.7E-10	1.3E-10	9.7E-11
SE	1.7E-08	2.5E-09	9.6E-10	5.2E-10	3.3E-10	2.3E-10	1.7E-10	1.3E-10
SSE	1.1E-08	1.6E-09	6.1E-10	3.3E-10	2.1E-10	1.5E-10	1.1E-10	8.3E-11
S	1.4E-08	1.9E-09	7.4E-10	4.0E-10	2.5E-10	1.8E-10	1.3E-10	1.0E-10
SSW	1.2E-08	1.7E-09	6.7E-10	3.6E-10	2.3E-10	1.6E-10	1.2E-10	9.2E-11
SW	1.8E-08	2.6E-09	1.0E-09	5.4E-10	3.5E-10	2.4E-10	1.8E-10	1.4E-10
WSW	2.2E-08	3.1E-09	1.2E-09	6.6E-10	4.2E-10	2.9E-10	2.2E-10	1.7E-10
W	3.1E-08	4.4E-09	1.7E-09	9.2E-10	5.9E-10	4.1E-10	3.0E-10	2.3E-10
WNW	2.9E-08	4.1E-09	1.6E-09	8.6E-10	5.4E-10	3.8E-10	2.8E-10	2.2E-10
NW	3.1E-08	4.3E-09	1.7E-09	9.1E-10	5.8E-10	4.0E-10	3.8E-10	2.3E-10
NNW	2.1E-08	3.0E-09	1.2E-09	6.3E-10	4.0E-10	2.8E-10	2.1E-10	1.6E-10
N	1.9E-08	2.7E-09	1.0E-09	5.7E-10	3.6E-10	2.5E-10	1.9E-10	1.4E-10

Table 3.5.2-7, cont'd

TABLE 3.5.2-7

Sector	Miles: 8.50	10.00	15.00	25.01	35.01	45.01	1.00	1.90
	Kilometers: 13.68	16.09	24.14	40.23	56.33	72.42	1.61	3.06
NNE	1.1E-10	8.1E-11	3.9E-11	1.5E-11	7.7E-12	4.6E-12	5.3E-09	1.6E-09
NE	1.2E-10	9.1E-11	4.4E-11	1.7E-11	8.6E-12	5.1E-12	5.9E-09	1.8E-09
ENE	7.9E-11	5.9E-11	2.9E-11	1.1E-11	5.6E-12	3.3E-12	3.9E-09	1.2E-09
E	5.8E-11	4.4E-11	2.1E-11	8.0E-12	4.1E-12	2.5E-12	2.9E-09	8.8E-10
ESE	7.8E-11	5.8E-11	2.8E-11	1.1E-11	5.5E-12	3.3E-12	3.8E-09	1.2E-09
SE	1.1E-10	7.9E-11	3.8E-11	1.4E-11	7.4E-12	4.4E-12	5.2E-09	1.6E-09
SSE	6.7E-11	5.0E-11	2.4E-11	9.2E-12	4.7E-12	2.8E-12	3.3E-09	1.0E-09
S	8.2E-11	6.1E-11	2.9E-11	1.1E-11	5.8E-12	3.4E-12	4.0E-09	1.2E-09
SSW	7.4E-11	5.5E-11	2.6E-11	1.0E-11	5.2E-12	3.1E-12	3.6E-09	1.1E-09
SW	1.1E-10	8.3E-11	4.0E-11	1.5E-11	7.8E-12	4.6E-12	5.4E-09	1.7E-09
WSW	1.3E-10	1.0E-10	4.8E-11	1.8E-11	9.5E-12	5.6E-12	6.6E-09	2.0E-09
W	1.9E-10	1.4E-10	6.7E-11	2.6E-11	1.3E-11	7.9E-12	9.2E-09	2.8E-09
WNW	1.7E-10	1.3E-10	6.3E-11	2.4E-11	1.2E-11	7.3E-12	8.5E-09	2.6E-09
NW	1.8E-10	1.4E-10	6.6E-11	2.5E-11	1.3E-11	7.8E-12	9.0E-09	2.8E-09
NNW	1.3E-10	9.6E-11	4.6E-11	1.8E-11	9.0E-12	5.4E-12	6.3E-09	1.9E-09
N	1.1E-10	8.6E-11	4.1E-11	1.6E-11	8.1E-12	4.8E-12	5.6E-09	1.7E-09

population doses which are directly dependent on the location and number of persons living in a given 22.5-degree sector. Since a practical prediction of future population trends was not readily obtained, FPL's 1980 population estimate (TABLE 3.5.3-1, below) and the NRC Staff's population estimation for 2020 (TABLE 3.5.3-4, below) were used as averaged population data for the dispersion data presented in TABLES 3.5.2-8 and 3.5.2-9.

3.5.3 Population Data: Section II of the Environmental Statement (1) gave estimates of the population in the site area. Future trends of population growth in the area have not been easily determined. However, TABLES 3.5.3-1 through 3.5.3-4 present four sets of population data that have been considered in this report. These data include FLORIDA POWER and LIGHT COMPANY's estimation for the years 1980 and 2000 (TABLES 3.5.3-1 and -2) and data used by the NRC staff for the years 1980 and 2020 (TABLES 3.5.3-3 and -4). In each set, the data is reported by sector and distance from the site.

The following age distributions were assumed to calculating population doses:

a.	Adult	66%
b.	Teen	14%
c.	Children/Infants	20%

TABLE 3.5.2-8

ST. LUCIE PLANT: Population-Averaged Gaseous Dispersion Data

FPL 1980 Data

A. FOR PLANT VENT:

Sector	χ/Q sec/m^3	Distance meters	Depleted χ/Q sec/m^3	Distance meters	Specific Deposition $1/m^2$	Distance meters	Population
Plant Vent							
N	8.60E-07	2400	7.3E-07	2400	1.4E-09	2400	300
NNE	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-
SE	-	-	-	-	-	-	-
SSE	5.90E-09	48000	3.8E-09	45600	5.60E-12	41800	244460
S	1.00E-08	26450	6.9E-09	25000	2.30E-11	24100	44985
SSW	9.90E-09	24300	6.8E-09	23750	2.25E-11	22700	17045
SW	3.05E-08	12200	2.3E-08	11800	1.00E-10	12750	8990
WSW	3.50E-08	12400	2.8E-08	12100	1.05E-10	13250	11620
W	2.60E-08	17750	2.0E-08	16800	8.15E-11	19600	9690
WNW	5.10E-08	13000	4.0E-08	12800	1.20E-10	13100	16435
NW	4.05E-08	15700	3.1E-08	15350	9.50E-11	15650	57040
NNW	1.90E-08	25500	1.35E-08	26450	2.55E-11	24500	49725

Table 3.5.2-8, cont'd

TABLE 3.5.2-8 (cont'd)

B. FOR STEAM JET AIR EJECTOR AND TURBINE BUILDING

N	1.20E-06	2400	9.0E-07	2400	2.70E-09	2400	300
NNE	–	–	–	–	–	–	–
NE	–	–	–	–	–	–	–
ENE	–	–	–	–	–	–	–
E	–	–	–	–	–	–	–
ESE	–	–	–	–	–	–	–
SE	–	–	–	–	–	–	–
SSE	7.50E-09	47200	3.3E-09	44400	8.65E-12	41700	244460
S	1.30E-09	47200	6.8E-09	24700	2.85E-11	24400	44985
SSW	1.30E-08	24100	7.25E-09	22550	3.00E-11	22600	17045
SW	4.00E-08	11900	2.6E-08	11200	1.35E-10	12300	8990
WSW	4.50E-08	12100	6.0E-08	11100	1.50E-10	12800	11620
W	3.40E-08	16950	2.2E-08	14800	1.25E-10	17300	9690
WNW	6.50E-08	13000	3.8E-08	12800	1.90E-10	13000	16435
NW	5.10E-08	15650	2.8E-08	15750	1.45E-10	15750	57040
NNW	2.35E-08	25700	1.2E-08	24100	4.60E-11	24100	49725

TABLE 3.5.2-9

ST. LUCIE PLANT: Population-Averaged Gaseous Dispersion Data

NRC Staff 2020 Data

A. FOR PLANT VENT:

Sector	χ/Q sec/m³	Distance meters	Depleted χ/Q sec/m³	Distance meters	Specific Deposition 1/m²	Distance meters	Sector Population
Plant Vent							
N	8.60E-07	2400	7.30E-07	1600	1.40E-09	2400	1480
NNE	–	–	–	–	–	–	–
NE	–	–	–	–	–	–	–
ENE	–	–	–	–	–	–	–
E	–	–	–	–	–	–	–
ESE	–	–	–	–	–	–	–
SE	1.10E-06	2400	9.00E-07	1600	1.00E-09	2400	1000
SSE	6.35E-09	45200	4.15E-09	43000	6.15E-12	39800	664860
S	1.30E-08	21700	8.55E-09	21800	2.95E-11	21350	291605
SSW	9.10E-09	26600	6.15E-09	26100	2.05E-11	23900	161500
SW	2.50E-08	13700	1.80E-08	13700	8.80E-11	13700	72620
WSW	3.00E-08	13450	2.30E-08	13400	9.70E-11	13950	64030
W	2.65E-08	17450	1.95E-08	17200	1.00E-10	17200	71400
WNW	3.40E-08	17400	2.60E-08	17200	7.80E-11	16950	74470
NW	2.85E-08	20900	2.15E-08	20600	6.45E-11	19850	135805
NNW	2.00E-08	24100	1.50E-08	24100	2.80E-11	23300	167740

TABLE 3.5.2-9 (cont'd)

B. FOR STEAM JET AIR EJECTOR AND TURBINE BUILDING

N	1.20E-06	2400	9.00E-07	2400	2.70E-09	2400	1480
NNE	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-
E	-	-	-	-	-	-	-
ESE	-	-	-	-	-	-	-
SE	1.50E-06	2400	1.10E-06	2400	2.50E-09	2400	1000
SSE	8.15E-09	44000	3.85E-09	40000	4.80E-12	29300	664860
S	1.60E-08	22300	8.60E-09	21600	3.70E-11	21500	291605
SSW	1.20E-08	26150	6.45E-09	24050	2.70E-11	23750	161500
SW	3.20E-08	13450	1.85E-08	13500	1.10E-10	13700	72620
WSW	3.70E-08	13500	2.10E-08	13400	1.35E-10	13450	64030
W	3.30E-08	17400	1.80E-08	16800	1.30E-10	16900	71400
WNW	4.30E-08	17400	2.40E-08	17050	1.20E-10	17000	74470
NW	3.60E-08	20850	1.95E-08	20100	9.85E-11	19850	135805
NNW	2.55E-08	23850	1.45E-08	21950	5.10E-11	23000	167740

TABLE 3.5.3-1

ST. LUCIE PLANT SITE:

Population Data - 1980*

Sector/Distance miles	0-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
N	300	0	0	0	0	0	0	0	0	300
NNE	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0
SSE	0	0	400	2910	4150	4700	22300	63000	147000	244460
S	0	0	80	255	5200	20450	1900	600	16500	44985
SSW	0	160	180	120	2160	1875	3500	750	8300	17045
SW	45	75	0	1010	3450	860	1900	750	900	8990
WSW	100	120	50	750	2950	900	700	4750	1300	11620
W	40	125	80	285	1050	1100	360	5000	1650	9690
WNW	0	85	130	370	11750	1700	800	850	750	16435
NW	0	0	65	135	31940	5600	15400	2200	1700	57040
NNW	0	200	300	675	4650	5100	30300	4800	3700	49725
Total	485	765	1285	6510	67300	42285	77160	82700	181800	460290

*FPL data appearing in Environmental Report as Rev. 6

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Table 3.5.3-2

ST. LUCIE PLANT SITE:

Population Data - 2000*

Sector/Distance miles	0-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
N	550	0	0	0	0	0	0	0	0	550
NNE	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0
SSE	80	10	630	3160	6250	8500	32500	92000	241000	384130
S	0	0	110	390	9250	35000	4500	1000	27000	77250
SSW	0	270	205	190	3800	3800	10000	1250	14000	33515
SW	55	150	30	1220	5650	1800	5500	1250	1600	17255
WSW	120	140	100	850	4300	1600	1100	9700	2600	20510
W	40	220	180	575	1800	1900	700	10000	3500	18915
WNW	0	100	305	460	17420	3300	1600	2200	1600	26985
NW	0	0	65	190	51550	11000	28000	4000	3000	97805
NNW	50	350	480	875	6700	9500	55000	8300	6500	87755
Total	895	1240	2105	7910	106720	76400	138900	129700	300800	764670

*FPL data appearing in Environmental Report as Rev. 6.

Table 3.5.3-3

ST. LUCIE PLANT SITE:

Population Data - 1980*

Sector/Distance miles	0-2	2-3	3-4	4-5	5-10	10-20	2--30	30-40	40-50	Total
N	1000	0	0	0	0	0	0	0	0	1000
NNE	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0
SE	300	0	0	0	0	0	0	0	0	300
SSE	350	125	225	2000	4800	1390	3555	116665	143125	272235
S	0	0	65	240	15000	30445	7116	20219	26132	99217
SSW	0	130	415	610	6100	2300	4955	19575	26132	60217
SW	0	130	405	595	6600	1975	3890	2505	1465	17565
WSW	60	50	450	645	6000	1800	3160	1265	1365	14795
W	0	150	200	575	4800	1800	2830	3485	4695	18535
WNW	0	125	240	650	5800	1800	3005	3895	5355	20870
NW	0	0	65	200	32800	1800	3490	5745	27700	71800
NNW	0	0	0	0	6400	950	38655	6065	24500	76570
Total	1710	710	2065	5515	88300	44260	70656	179419	260469	653104

*NRC Staff data; Testimony FA St. Mary, 11/4/74

Table 3.5.3-4

ST. LUCIE PLANT SITE:

Population Data - 2020*

Sector/Distance miles	0-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
N	1480	0	0	0	0	0	0	0	0	1480
NNE	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0
SE	1000	0	0	0	0	0	0	0	0	1000
SSE	800	900	730	2410	17500	3905	9135	282680	346800	664860
S	0	0	250	300	75000	85470	18275	48990	63320	291605
SSW	0	200	1450	1760	27500	6420	13340	47510	63320	161500
SW	0	150	1600	2150	42500	5235	10910	6530	3545	72620
WSW	100	100	500	750	42500	4400	8335	4065	3280	64030
W	0	150	300	750	32500	4400	7505	11175	14620	71400
WNW	0	125	300	800	34000	4400	7420	11210	16215	74470
NW	0	0	65	200	52500	4350	8105	13070	57515	135805
NNW	800	915	1035	2630	8000	2255	89475	12890	49940	167940
Total	4180	2540	6230	11750	332000	120835	172500	438120	618555	1,706,710

*NRC Staff data; Testimony of FA St. Mary, 11/4/74

Although the proportion of adults in the Florida population is recognized as being slightly higher than the national average, the above values (used by the NRC staff in its own calculations) are representative of the national average. Such values introduce some conservatism into the population dose calculations for ST. LUCIE PLANT, UNIT No. 1.

TABLE 2.3-1 presented data on the distances from the centerline of ST. LUCIE PLANT, UNIT No. 1 to the nearest resident population activity (that is, to the nearest milk-producing animal and/or vegetable garden). No milk cows, milk goats or meat animals are located within 5.0 miles of ST. LUCIE PLANT: the nearest milk-producing animal is approximately 7.5 miles SSW the plant site. The nearest residence is about 1.5 miles WSW the plant site.

TABLE 2.3-1 also established the distances that UNIT No. 1 is to the nearest site boundary in each of the 22.5-degree nadial sectors centered on the cardinal compass points.

3.5.4 <u>Food Pathways</u>: The 50-mile area surrounding the site of PLANT ST. LUCIE, UNIT No. 1 includes all or significant portions of these six counties: (1) St. Lucie, (2) Martin, (3) Indian River, (4) Palm Beach,

(5) Okeechobee, and (6) Brevard. These areas produce a variety of agricultural products, many in large quantities or volumes. Data about some of these products has been given already in the Environmental Statement (1). SUPPLEMENT B extends that information so that a more reasonable description of the agricultural productivity and activities in the areas adjacent to the ST. LUCIE PLANT site is provided. That compilation shows agricultural product data for each county. It is classified by species and an appropriate point or points chosen within each county to represent the center of production for that particular product.

In order to add more validity to the input data used in population dose calculations, all vegetable products were classified as follows:

a. Leafy: Grown in open fields, exterior surface eaten;

b. Exposed: Grown in open fields, exterior surface not eaten, and

c. Root: Grown under the surface, exterior surface not usually eaten.

Because of the importance of citrus fruits in the area, oranges and grapefruit were treated separately. About 90% of the orange crop and 35% of the grapefruit crop are processed into canned fruits, canned juice, and frozen juice. All other portions of these crops are hand eaten. Other major agricultural products considered

in our calculations were milk and beef. Sugar cane and honey, peculiar to the 50-mile area surrounding ST. LUCIE PLANT, have also been treated as major agricultural products. Sugar cane production occurs mostly within the western sections of Palm Beach County. Honey is produced in transient colonies of bees used to pollinate the citrus fruit trees of the area.

These food crop data are summarized in TABLES 3.5.4-1 through 3.5.4-5. Each table also includes these other input parameters for dose calculations:

a. Food yield, kg/m^2, or lbs/head/year;
b. Deposition modifier(See Note 1);
c. Food preparation modifier (See Note 2);
d. Time between harvest and consumption; seconds;
e. Location of food product-direction by cardinal point, and distance from plant site, meters; and
f. Meteorological dispersion factors.

The deposition and food preparation modifiers are not included in Regulatory Guide 1.109, but were obtained from the HERMES Report (2). We believe the factors we have used to be appropriate for the calculations used in this compliance demonstration.

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1. The modifier applied to first term in plant uptake equations to allow for nonedibility of exposed surface. Factors taken from TABLE III-6 HEDL-TME-71-168 (See Reference #2).

2. The modifier applied to dose to allow for loss of activity in preparation of food before eating. Factors taken from TABLE III-15, HEDL, loc. cit.

TABLE 3.5.4-1

ST. LUCIE PLANT SITE: Input Data For Population Dose - CITRUS FRUIT

Input Data \ County	St. Lucie		Martin		Indian River		Palm Beach		Okeechobee[e]		Brevard[b]	
	F[a]	P[a]	F	P	F	P	F	P	F	P	F	P
1. Yield, kg./yr.[b]	2.56E+08	4.81E+08	3.9E+07	2.5E+08	2.25E+08	3.00E+08	4.0E+07	1.0E+08	3.5E+06	1.4E+07	1.0E+07	3.4E+07
2. Acreage[b]	8.0E+04		4.2E+04		6.0E+04		1.7E+04		2.2E+03		1.7E+04	
3. Specific Yield, kg./m^2	2.3	2.3	1.7	1.7	2.2	2.2	2.1	2.1	1.9	1.9	2	2
4. Absorption Modifier[c]	Grain III-6		Grain III-6		Grain III-6		Grain III-6		Grain III-6		Grain III-6	
5. Time to Consumption, sec.	1.21E+06	7.78E+06	1.21E+06	7.78E+06	1.21E+06	7.78+06	1.21E+06	7.78E+06	1.21E+06	7.78E+06	1.21E+06	7.78E+06
6. Preparation Molifier[d]	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4	1.0	0.4
7. Location of Crop												
a) Direction from Plant	NW	NW	SW	SW	NNW	NNW	S	S	W	W	NNW	NNW
b) Distance, Meters	3.22E+04		2.9E+04		4.5E+04		4.35E+04		6.45E+04		7.4E+04	
8. Specific Deposition, 1/m^2												
a) Plant Vent	2.8E-11		2.6E-11		8.2E-12		7.8E-12		9.6E-12		3.0E-12	
b) SJAE & Turbine	4.1E-11		3.0E-11		1.5E-11		9.7E-12		1.0E-11		5.2E-12	

TABLE 3.5.4-1 (cont'd.)

County / Input Data	St. Lucie F[a]	St. Lucie P[a]	Martin F	Martin P	Indian River F	Indian River P	Palm Beach F	Palm Beach P	Okeechobee[e] F	Okeechobee[e] P	Brevard[b] F	Brevard[b] P
9. Rel. Conc., χ/Q, sec./m^3												
a) Plant Vent	1.7E-08		9.8E-09		9.6E-09		5.5E-09		5.0E-09		5.0E-09	
b) SJAE & Turbine	2.2E-08		1.2E-08		1.1E-08		7.0E-09		6.2E-09		6.1E-09	
10. Sector, Av. Wind Speed, m/sec.	3.254		3.463		3.232		3.902		3.308		3.232	

NOTES:

a) F = Fresh Fruit; P = Processed Fruit

b) Data from Chapter 2, Environmental Statement (Ref. 1); Supplemented by SUPPLEMENT B.

c) Modifier applied to first term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME - 71 - 168.

d) Modifier applied to dose to allow for loss of activity in preparation of Food Factors taken from TABLE III-15, HERMES, Loc. cit.

e) Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE; 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie Area. All products are assumed to come from a point 40 miles WEST of the plant.

f) About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE; 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

TABLE 3.5.4-2

ST. LUCIE PLANT SITE: Input Data For Population Dose - LEAFY VEGETABLES

Species / Input Data	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
A. ST. LUCIE COUNTY										
1. Yield, Kg./Yr.[a]	8.71E+06									8.71E+06
2. Acreage[a]	8.75E+02									
3. Specific Yield, Kg./m^2	2.5									
4. Adsorption Modifier[b]	1.0									
5. Time to consumption, sec.	1.21E+06									
6. Preparation Modifier[c]	0.4									
7. Location of Crop										
a) Direction from Plant	W									
b) Distance, meters	3.22E+04									
8. Specific Deposition, 1/m^2										
a) Plant Vent	3.5E-11									
b) SJAE & Turbine	4.2E-11									
9. Rel. Conc., χ/Q, sec./m^3										
a) Plant Vent	1.2E-08									
b) SJAE & Turbine	1.6E-08									
10. Sector, Avg. Wind Speed, m/sec.	3.308									

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
B. MARTIN COUNTY										
1. Yield, Kg./yr[a]	5.0E+06	5.5E+06								1.05E+07
2. Acreage[a]	500	500								
3. Specific Yield kg./m^2	2.6	2.6								
4. Adsorption Modifier[b]	1.0	1.0								
5. Time to Consumption, sec.	1.21E+06	1.21E+06								
6. Preparation Modifier[c]	0.4	0.4								
7. Location of Crop										
a) Direction from plant	SW	SW								
b) Distance, Meters	2.9E+04	2.9E+04								
8. Specific Deposition, $1/m^2$										
a) Plant Vent	2.6E-11	2.6E-11								
b) SJAE & Turbine	3.0E-11	3.0E-11								
9. Rel. Conc., χ/Q, sec./m^3										
a) Plant Vent	9.8E-09	9.8E-09								
b) SJAE & Turbine	1.2E-08	1.2E-08								
10. Sector Avg. Wind Speed, m/sec.	3.463									

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
C. INDIAN RIVER COUNTY										
1. Yield, Kg./yr.[a]	7.0E+06									7.0E+06
2. Acreage[a]	700									
3. Specific Yield Kg./m^2	2.5									
4. Adsorption Modifier[b]	1.0									
5. Time to Consumption, sec.	1.21E+06									
6. Preparation Modifier[c]	0.4									
7. Location of Crop										
a) Direction from plant	NW									
b) Distance, Meters	6.75E+04									
8. Specific Deposition, 1/m^2										
a) Plant Vent	6.7E-12									
b) SJAE & Turbine	9.1E-12									
9. Rel. Conc., χ/Q, sec/m^3										
a) Plant Vent	6.4E-09									
b) SJAE & Turbine	7.9E-09									
10. Sector Avg. Wind Speed, m/sec.	3.254									

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
D. PALM BEACH COUNTY (EAST)										
1. Yield, Kg./yr.[a]	1.4E+07		2.7E+07	1.65E+07	3.8+06					6.1E+07
2 Acreage[a]	1.413		1.93E+04	2,200	1,350					
3. Specific Yield kg./m^2	2.45		0.35	1.85	0.7					
4. Adsorption Modifier[b]	← 1 →									
5. Time to Consumption, sec.	← 1.21E+06 →									
6. Preparation Modifier[c]	← 0.4 →									
7. Location of Crop										
a) Direction from plant	← 5 →									
b) Distance, Meters	← 5.50E+04 →									
8. Specific Deposition, 1/m^2										
a) Plant Vent	← 5.0E-12 →									
b) SJAE & Turbine	← 6.2E-12 →									
9. Rel. Conc., χ/Q, sec./m^3										
a) Plant Vent	← 4.1E-09 →									
b) SJAE & Turbine	← 5.2E-09 →									
10. Sector Avg. Wind Speed, m/sec.	← 3.902 →									

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
E. PALM BEACH COUNTY (WEST)										
1. Yield, Kg./yr.[a]		5.5E+06	2.8E+05			1.5E+08	2.8E+07	2.8E+06	4.4E+07	2.3E+08
2. Acreage[a]		500	200			8,690	4,750	650	5,680	
3. Specific Yield kg./m^2		2.7	0.35			4.3	1.5	1.1	1.9	
4. Adsorption Modifier[b]					← 1 →					
5. Time to Consumption, sec.					← 1.21E+06 →					
6. Preparation Modifier[c]					← 0.4 →					
7. Location of Crop										
a) Direction from plant					← SSW →					
b) Distance, Meters					← 6.30E+04 →					
8. Specific Deposition, $1/m^2$										
a) Plant Vent					← 3.6E-12 →					
b) SJAE & Turbine					← 4.2E-12 →					
9. Rel. Conc., χ/Q, sec./m^3										
a) Plant Vent					← 3.1E-09 →					
b) SJAE & Turbine					← 4.0E-09 →					
10. Sector Avg. Wind Speed, m/sec.					← 3.243 →					

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
F. OKEECHOBEE COUNTY[d]										
1. Yield, Kg./yr.[a]	4.4E+06									4.4E+06
2. Acreage[a]	440									
3. Specific Yield kg./m^2	2.5									
4. Adsorption Modifier[b]	1.0									
5. Time to Consumption, sec.	1.21E+06									
6. Preparation Modifier[c]	0.4									
7. Location of Crop										
a) Direction from plant	W									
b) Distance, Meters	6.45E+04									
8. Specific Deposition, 1/m^2										
a) Plant Vent	9.6E-12									
b) SJAE & Turbine	1.0E-11									
9. Rel. Conc., χ/Q, sec/m^3										
a) Plant Vent	5.0E-09									
b) SJAE & Turbine	6.2E-09									
10. Sector Avg. Wind Speed, m/sec.	3.308									

TABLE 3.5.4-2 continued:

	Tomatoes	Cabbage	Beans	Peppers	Squash	Celery	Escarole	Spinach	Lettuce	Total Annual Yield, Kg./Yr.[a]
G. BREVARD COUNTY[c]										
1. Yield, Kg./yr.[a]	1.4E+06									1.4E+06
2. Acreage[a]	140									
3. Specific Yield kg./m^2	2.5									
4. Adsorption Modifier[b]	1.0									
5. Time to Consumption, Sec.	1.21E+06									
6. Preparation Modifier[c]	0.4									
7. Location of Crop										
a) Direction from plant	NNW									
b) Distance, Meters	7.4E+04									
8. Specific Deposition, $1/m^2$										
a) Plant Vent	3.0E-12									
b) SJAE & Turbine	5.2E-12									
9. Rel. Conc., χ/Q, sec/m^3										
a) Plant Vent	5.0E-09									
b) SJAE & Turbine	6.1E-09									
10. Sector Avg. Wind Speed, m/sec.	3.232									

TABLE 3.5.4-2 continued:

Notes:

a. Data from Chapter 2, Environmental Statement (Ref. 1); supplemented by data from SUPPLEMENT B.

b. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

c. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc. cit.

d. Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE. 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 40 miles WEST of the plant.

e. About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE; 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

TABLE 3.5.4-3

ST. LUCIE PLANT SITE: Input Data For Population Dose - EXPOSED AND ROOT VEGETABLES

Species / Input Data	Exposed Vegetables: Corn	Exposed Vegetables: Cucumbers	Exposed Vegetables: Egg Plant	Exposed Vegetables: Watermelons	Total Exposed Vegetable Yield Kg./yr.[a]	Root Vegetables: Potatoes	Root Vegetables: Radishes	Total Root Vegetable Yield Kg./yr.[a]
A. ST. LUCIE COUNTY								
1. Yield, Kg./yr.[a]				1.36E+06	1.36E+06			
2. Acreage[a]				2.0E+02				
3. Specific Yield kg./m^2				1.7				
4. Adsorption Modifier[b]				Grain III-6				
5. Time to Consumption, sec.				1.21E+06				
6. Preparation Modifier[c]				1.0				
7. Location of Crop								
a) Direction from plant				W				
b) Distance, Meters				3.22E+04				
8. Specific Deposition, 1/m^2								
a) Plant Vent				3.5E-11				
b) SJAE & Turbine				4.2E-11				
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent				1.2E-08				
b) SJAE & Turbine				1.6E-08				
10. Sector Avg. Wind Speed, m/sec.				3.308				

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
B. MARTIN COUNTY								
1. Yield, Kg./yr.[a]				1.4E+06	1.4E+06	5.0E+06		5.0E+6
2. Acreage[a]				200		600		
3. Specific Yield Kg./m^2				1.7		2.0		
4. Adsorption Modifier[b]				Grain, III-6		Root, III-6		
5. Time to Consumption, sec.				1.21E+06		1.21E+06		
6. Preparation Modifier[c]				1.0		0.75		
7. Location of Crop								
a) Direction from plant				SW		SW		
b) Distance, Meters				2.9E+04		2.9E+04		
8. Specific Deposition, 1/m^2								
a) Plant Vent				2.6E-11		2.6E-11		
b) SJAE & Turbine				3.0E-11		3.0E-11		
9. Rel. Conc., χ/Q, sec/m^3								
a) Plant Vent				9.8E-09		9.8E-09		
b) SJAE & Turbine				1.2E-08		1.2E-08		
10. Sector Avg. Wind Speed, m/sec.				3.463		3.463		

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield, Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
C. INDIAN RIVER COUNTY								
1. Yield, Kg./yr.[a]				1.4E+06	1.4E+06			
2. Acreage[a]				200				
3. Specific Yield kg./m^2				1.7				
4. Adsorption Modifier[b]				Grain, III-6				
5. Time to Consumption, sec.				1.21E+06				
6. Preparation Modifier[c]				1.0				
7. Location of Crop								
a) Direction from plant				NW				
b) Distance, Meters				6.75E+04				
8. Specific Deposition, 1/m^2								
a) Plant Vent				6.7E-12				
b) SJAE & Turbine				9.1E-12				
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent				6.4E-09				
b) SJAE & Turbine				7.9E-09				
10. Sector Avg. Wind Speed, m/sec.				3.254				

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield, Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
D. PALM BEACH COUNTY (EAST)								
1. Yield, Kg./yr.[a]	7.6E+07	7.9E+06	8.9E+06		9.3E+07			
2. Acreage[a]	1.67E+04	1,070	820					
3. Specific Yield kg./m^2	1.1	1.8	2.7					
4. Adsorption Modifier[b]	← Grain, III-6 →							
5. Time to Consumption, sec.	← 1.21E+06 →							
6. Preparation Modifier[c]	← 1.0 →							
7. Location of Crop								
a) Direction from plant	← S →							
b) Distance, Meters	← 5.50E+04 →							
8. Specific Deposition, 1/m^2								
a) Plant Vent	← 5.0E-12 →							
b) SJAE & Turbine	← 6.2E-12 →							
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent	← 4.1E-09 →							
b) SJAE & Turbine	← 5.2E-09 →							
10. Sector Avg. Wind Speed, m/sec.	← 3.903 →							

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield, Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
E. PALM BEACH COUNTY (WEST)								
1. Yield, Kg./yr.[a]	1.1E+08				1.1E+08	5.0E+6	2.2E+07	
2. Acreage[a]	2.4E+04					600	1.33E+04	
3. Specific Yield Kg./m^2	1.1					2.0	0.4	
4. Adsorption Modifier[b]	Grain, III-6					← Root, III-6 →		
5. Time to Consumption, sec.	1.2.E+06							
6. Preparation Modifier[c]	1.0					← 0.75 →		
7. Location of Crop								
a) Direction from plant	SSW					← SSW →		
b) Distance, Meters	6.30E+04					← 6.30E+04 →		
8. Specific Deposition, 1/m^2								
a) Plant Vent	3.6E-12					← 3.6E-12 →		
b) SJAE & Turbine	4.2E-12					← 4.2E-12 →		
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent	3.1E-09					← 3.1E-09 →		
b) SJAE & Turbine	4.0E-09					← 4.0E-09 →		
10. Sector Avg. Wind Speed, m/sec.	3.243					← 3.243 →		

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield, Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
F. OKEECHOBEE COUNTY[d]								
1. Yield, Kg./yr.[a]				6.8E+05				
2. Acreage[a]				100				
3. Specific Yield Kg./m^2				1.7				
4. Adsorption Modifier[b]				Grain, III-6				
5. Time to Consumption, sec.				1.4E+06				
6. Preparation Modifier[c]				1.0				
7. Location of Crop								
a) Direction from plant				W				
b) Distance, Meters				6.45E+04				
8. Specific Deposition, 1/m^2								
a) Plant Vent				9.6E-12				
b) SJAE & Turbine				1.0E-11				
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent				5.0E-09				
b) SJAE & Turbine				6.2E-09				
10. Sector Avg. Wind Speed, m/sec.				3.308				

TABLE 3.5.4-3 continued:

	Exposed Vegetables				Total Exposed Vegetable Yield, Kg./yr.[a]	Root Vegetables		Total Root Vegetable Yield Kg./yr.[a]
	Corn	Cucumbers	Egg Plant	Watermelons		Potatoes	Radishes	
G. BREVARD COUNTY[e]								
1. Yield, Kg./yr.[a]				2.7E+05				
2. Acreage[a]				40				
3. Specific Yield Kg./m^2				1.7				
4. Adsorption Modifier[b]				Grain, III-6				
5. Time to Consumption, sec.				1.21E+06				
6. Preparation Modifier[c]				1.0				
7. Location of Crop								
a) Direction from plant				NNW				
b) Distance, Meters				7.4E+04				
8. Specific Deposition, 1/m^2								
a) Plant Vent				3.0E-12				
b) SJAE & Turbine				5.2E-12				
9. Rel. Conc., χ/Q, sec./m^3								
a) Plant Vent				5.0E-09				
b) SJAE & Turbine				6.1E-09				
10. Sector Avg. Wind Speed, m/sec.				3.232				

NOTES: TABLE 3.5.4-3 continued:

a. Data from Chapter 2, Environmental Statement (Ref. 1); supplemented by data from SUPPLEMENT B.

b. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

c. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc. cit.

d. Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE. 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 50 miles WEST of the plant.

e. About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE; 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

TABLE 3.5.4-4

ST. LUCIE PLANT SITE: Input Data For Population Dose - HONEY[a]

Input Data / County	ST. LUCIE	MARTIN	INDIAN RIVER	PALM BEACH	OKEECHOBEE[e]	BREVARD[f]
1. Yield, Kg./yr.[b]	2.7E+05	1.2E+05	2.1E+05	5.6E+04	7.0E+03	1.8E+04
2. Acreage[b]						
3. Specific Yield kg./m^2	← 4.0E-03 →					
4. Adsorption Modifier[c]	← 1.0 →					
5. Time to Consumption, sec.	← 7.78E+06 →					
6. Preparation Modifier[d]	← 1.0 →					
7. Location of Crop						
a) Direction from plant	NW	SW	NNW	S	W	NNW
b) Distance, Meters	3.22E+04	2.9E+04	4.5E+04	4.35E+04	6.45E+04	7.4E+04
8. Specific Deposition, 1/m^2						
a) Plant Vent	2.8E-11	2.6E-11	8.2E-12	7.8E-12	9.6E-12	3.0E-12
b) SJAE & Turbine	4.1E-11	3.0E-11	1.5E-11	9.7E-12	1.0E-11	5.2E-12
9. Rel. Conc., χ/Q, sec./m^3						
a) Plant Vent	1.7E-08	9.8E-09	9.6E-09	5.5E-09	5.0E-09	5.0E-09
b) SJAE & Turbine	2.2E-08	1.2E-08	1.1E-08	7.9E-09	6.2E-09	6.1E-09
10. Sector Avg. Wind Speed, m/sec.	3.254	3.463	3.232	3.902	3.308	3.232

TABLE 3.5.4-4 continued:

NOTES:

a. Complete transfer of activity from flower to honey assumed in these data.

b. Data from Chapter 2, Environmental Statement (Ref. 1); supplemented by data from SUPPLEMENT B.

c. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

d. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc. cit.

e. Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE. 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 40 miles WEST of the plant.

f. About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE; 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

TABLE 3.5.4-5

ST. LUCIE PLANT SITE: Input Data For Population Dose - SUGAR CANE

Input Data / County	ST. LUCIE	MARTIN	INDIAN RIVER	PALM BEACH[d]	OKEECHOBEE	BREVARD
1. Yield, Kg./yr.[a]				3.4E+08		
2. Acreage[a]				1.35E+05		
3. Specific Yield kg./m^2				0.67		
4. Adsorption Modifier[b]				1.0		
5. Time to Consumption, sec.				7.78E+06		
6. Preparation Modifier[c]				0.4		
7. Location of Crop						
a) Direction from plant				SSW		
b) Distance, Meters				6.30E+04		
8. Specific Deposition, 1/m^2						
a) Plant Vent				3.6E-12		
b) SJAE & Turbine				4.2E-12		
9. Rel. Conc., χ/Q, sec./m^3						
a) Plant Vent				3.1E-09		
b) SJAE & Turbine				4.0E-09		
10. Sector Avg. Wind Speed, m/sec.				3.243		

TABLE 3.5.4-5 continued:

NOTES:

a. Data from Chapter 2, Environmental Statement (Ref. 1); supplimented by data from SUPPLEMENT B.

b. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

c. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc cit.

d. > 90% of SUGAR CANE growth occurs in PALM BEACH COUNTY.

It should be noted that the population dose calculations have been based on food pathways, not on population density. The food yields considered here are sufficient to feed many more people than actually live in the 50-mile area about ST. LUCIE PLANT. Thus, in calculating population doses, the entire population dose produced within 50 miles from these food pathways, whether or not the food consumption takes place within that area, was accepted as being more technically correct for this determination of compliance with APPENDIX I.

Tabulations in SUPPLEMENT B also give data on the milk and meat production in the areas surrounding ST. LUCIE PLANT, UNIT No. 1. The data for these major food pathways were treated in the same manner as those described above for the fruit and vegetable pathways and input parameters for them are tabulated in TABLES 3.5.4-6 and -7.

3.5.5 Other Pathways: No other pathways which might increase the calculated doses by as much as 10% were found.

3.6 COMPUTATION OF INDIVIDUAL DOSES FROM GASEOUS RELEASES

The gaseous releases data given in TABLE 3.4-1 above were combined with the environmental parameters outlined in Section 3.5 and the individual doses computed using the GASI code (3). The results of these calculations are summarized in TABLE 3.6-1.

TABLE 3.5.4-6.

ST. LUCIE PLANT SITE: Input Data For Population Dose - MILK

Input Data / County	ST. LUCIE	MARTIN	INDIAN RIVER	PALM BEACH	OKEECHOBEE[d]	BREVARD[e]
1. Yield, Kg./yr.[a]	1.4E+07	2.0E+07	7.7E+06	4.5E+07	6.7E+07	3.0E+06
2. Acreage[a]						
3. Specific Yield Kg./m^2						
4. Adsorption Modifier[b]	← 1.0 →					
5. Time to Consumption, sec.	← 3.45E+05 →					
6. Preparation Modifier[g]	← 1.0 →					
7. Location of Crop						
a) Direction from plant	W	SW	NW	SSW	W	NNW
b) Distance, Meters	3.22E+04	2.9E+04	6.45E+04	6.30E+04	6.45E+04	7.4E+04
8. Specific Deposition, 1/m^2						
a) Plant Vent	3.5E-11	2.6E-11	7.4E-12	3.6E-12	9.6E-12	3.0E-12
b) SJAE & Turbine	4.2E-11	3.0E-11	1.0E-11	4.2E-12	1.0E-11	5.2E-12
9. Rel. Conc., χ/Q, sec./m^3						
a) Plant Vent	1.2E-08	9.8E-09	6.9E-09	3.1E-09	5.0E-09	5.0E-09
b) SJAE & Turbine	1.6E-08	1.2E-08	8.3E-09	4.0E-09	6.2E-09	6.1E-09
10. Sector Avg. Wind Speed, m/sec.	3.308	3.463	3.254	3.243	3.308	3.232

NOTES: TABLE 3.5.4-6 continued:

a. Data from Chapter 2, Environmental Statement (Ref. 1); supplemented by data from SUPPLEMENT B.

b. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

c. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc. cit.

d. Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE. 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 40 miles WEST of the plant.

e. About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE; unless stated elsewhere, 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

f. No data--taken as 20% of ST. LUCIE County production.

TABLE 3.5.4-7

ST. LUCIE PLANT SITE: Input Data For Population Dose - BEEF[a]

Input Data \ County	ST. LUCIE	MARTIN	INDIAN RIVER	PALM BEACH	OKEECHOBEE[e]	BREVARD[f]
1. Yield, Kg./yr.[b]	6.25E+06	7.75E+06	7.5E+06	8.75E+06	3.8E+06	1.25E+06
2. Acreage[b]						
3. Specific Yield kg./m^2						
4. Adsorption Modifier[c]	←—— 1.0 ——→					
5. Time to Consumption, sec.	←—— 1.73E+06 ——→					
6. Preparation Modifier[d]	←—— 1.0 ——→					
7. Location of Crop						
a) Direction from plant	W	SW	NW	SSW	W	NNW
b) Distance, Meters	3.22E+04	2.9E+04	6.45E+04	6.30E+04	6.45E+04	7.4E+04
8. Specific Deposition, 1/m^2						
a) Plant Vent	3.5E-11	2.6E-11	7.4E-12	3.6E-12	9.6E-12	3.0E-12
b) SJAE & Turbine	4.2E-11	3.0E-11	1.0E-11	4.2E-12	1.0E-11	5.2E-12
9. Rel. Conc., χ/Q, sec./m^3						
a) Plant Vent	1.2E-08	9.8E-09	6.9E-09	3.1E-09	5.0E-09	5.0E-09
b) SJAE & Turbine	1.6E-08	1.2E-08	8.3E-09	4.0E-09	6.2E-09	6.1E-09
10. Sector Avg. Wind Speed, m/sec.	3.308	3.463	3.254	3.243	3.308	3.232

NOTES: TABLE 3.5.4-7 continued:

a. Estimated at 550 lb./(year) (head).

b. Data from Chapter 2, Environmental Statement (Ref. 1); supplemented by data from SUPPLEMENT B.

c. Modifier applied to uptake term in plant uptake equations to allow for nonedibility of exposed surfaces. Factors taken from TABLE III-6, HERMES - HEDL - TME-71-168.

d. Modifier applied to dose to allow for loss of activity in preparation of food; factors taken from TABLE III-15, HERMES, loc. cit.

e. Less than 50% of Okeechobee County lies within 50 miles of PLANT ST. LUCIE. 50% of the Okeechobee County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 40 miles WEST of the plant.

f. About 20% of Brevard County lies within 50 miles of PLANT ST. LUCIE: 20% of Brevard County agricultural activities have been arbitrarily assigned to the St. Lucie area. All products are assumed to come from a point 46 miles NNW of the plant.

TABLE 3.6-1

ST. LUCIE PLANT, UNIT No. 1: Individual Doses From Gaseous Releases-All Pathways For "As-Built" System

A. At Nearest Residence (3,158 meters, WSW)

Pathway	Adults	Teens	Children	Infants
	Dose, mrem/year			
1. For Total Body				
Noble Gas Immersion	6.33E-02	6.33E-02	6.33E-02	6.33E-02
Ground Plane Deposition	1.27E-02	1.27E-02	1.27E-02	1.27E-02
Inhalation	7.79E-03	4.43E-03	4.64E-03	5.03E-03
Stored Fruits & Vegetables	3.78E-02	4.91E-02	1.02E-01	-
Fresh Fruits & Vegetables	4.86E-03	3.45E-03	5.40E-03	-
Milk	2.62E-02	3.14E-02	5.14E-02	9.56E-02
Total Gaseous	1.53E-01	1.64E-01	2.39E-01	1.77E-01
2. For Thyroid[a]				
Noble Gas Immersion	6.33E-02	6.33E-02	6.33E-02	6.33E-02
Ground Plane Deposition	1.27E-02	1.27E-02	1.27E-02	1.27E-02
Inhalation	2.60E-02	1.98E-02	2.49E-02	3.98E-02
Stored Fruits & Vegetables	3.77E-02	5.11E-02	1.12E-01	-
Fresh Fruits & Vegetables	1.06E-01	8.16E-02	1.22E-01	-
Milk	5.10E-01	7.66E-01	1.52E 00	3.66E 00
Total Gaseous	7.56E-01	9.95E-01	1.85E 00	3.78E 00

TABLE 3.6-1 cont.

B. At Nearest Cow (12,000 meters, SSW)

Pathway	Adults	Teens	Children	Infants
	Dose, mrem/year			
1. For Total Body				
Noble Gas Immersion	4.43E-03	4.43E-03	4.43E-03	4.43E-03
Ground Plane Deposition	6.25E-04	6.25E-04	6.25E-04	6.25E-04
Inhalation	5.48E-04	3.12E-04	3.26E-04	3.54E-04
Stored Fruits & Vegetables	2.56E-03	3.37E-03	7.15E-03	-
Fresh Fruits & Vegetables	3.26E-04	2.33E-04	3.72E-04	-
Meat	6.02E-04	4.27E-04	7.56E-04	-
Milk	9.74E-04	1.35E-03	2.79E-03	5.49E-03
Total Gaseous	1.01E-02	1.07E-02	1.65E-02	1.09E-02
2. For Thyroid[a]				
Noble Gas Immersion	4.43E-03	4.43E-03	4.43E-03	4.43E-03
Ground Plane Deposition	6.25E-04	6.25E-04	6.25E-04	6.25E-04
Inhalation	1.72E-03	1.29E-03	1.63E-03	2.58E-03
Stored Fruits & Vegetables	2.55E-03	3.46E-03	7.59E-03	-
Fresh Fruits & Vegetables	5.18E-03	3.96E-03	5.92E-03	-
Meat	2.44E-03	1.70E-03	2.68E-03	-
Milk	1.77E-02	2.66E-02	5.29E-02	1.26E-01
Total Gaseous	3.46E-02	4.21E-02	7.58E-02	1.34E-01

Note:

a. All other organ doses are lower than thyroid.

3.7 POPULATION DOSES FROM GASEOUS RELEASES

Six (6) food-and population-oriented pathways were evaluated in determining the potential population doses from UNIT No. 1's gaseous discharges. The major food pathways - (1) fruits and vegetables (2) milk and (3) meat - depend, respectively, on the crop production data given in Paragraph 3.5.4 and the meat and milk data given in Paragraph 3.5.5. The population-oriented pathways - (1) noble gas immersion (2) ground plume deposition and (3) inhalation - depend on the atmospheric dispersion and population data described in Paragraphs 3.5.2 and 3.5.3.

Population doses have been calculated using the GASP Code (3). These results are shown in TABLE 3.7-1.

3.8 REFERENCES

1. United States Atomic Energy Commission, Directorate of Licensing, "The Final Environmental Statement Related to the ST. LUCIE PLANT, UNIT No. 1, Florida Power and Light Company," Washington, D.C., June, 1973.

2. J. E. Fletcher, et al, "HERMES--Digital Computer Code for Estimating Regional Radiological Effects from the Power Industry," HEDL-TME-71-168, December, 1971.

3. Constructed by NUCLEAR SAFETY ASSOCIATES, Bethesda, Maryland.

TABLE 3.7-1

ST. LUCIE PLANT, UNIT No.1: Population Doses From Gaseous Releases-All Pathways For "As-Built" System

A. For 1980 Population Data[a]

Pathway	Population Doses, mrem/yr Thyroid	Total Body	Total
1. Via Food Chains			
Fruits & Vegetables	4.43E 00	3.53E 00	7.96E 00
Milk	1.57E 00	1.46E-01	1.72E 00
Meat	8.87E-02	6.35E-02	1.52E-01
Total Food Pathways	6.09E 00	3.74E 00	9.83E 00
2. Via Other Pathways			
Noble Gas Immersion	8.48E-01	8.48E-01	1.70E 00
Ground Plane Deposition	9.56E-02	9.56E-02	1.91E-01
Inhalation	4.37E-01	1.26E-01	5.63E-01
Total from Other Pathways	1.38E 00	1.07E 00	2.45E 00
3. TOTAL 1980 Population	7.47E 00	4.81E 00	1.23E+01

B. For 2020 Population Data[a]

Pathway	Thyroid	Total Body	Total
1. Total via Food Chains (same as 1980 data)	6.09E 00	3.74E 00	9.83E 00
2. Via Other Pathways			
Noble Gase Immersion	3.15E 00	3.15E 00	6.30E 00
Ground Plane Deposition	3.76E-01	3.76E-01	7.52E-01
Inhalation	1.62E 00	4.69E-01	2.09E 00
Total from Other Pathways	5.15E 00	3.99E 00	9.14E 00
3. TOTAL 2020 Population	1.12E+01	7.73E 00	1.89E+01

a. Use of FPL Data in TABLE 3.5.3-1

b. Use os NRC Staff Data in TABLE 3.5.3-4

SECTION 4.0

DOSE DATA FOR "AS-BUILT" LIQUID TREATMENT SYSTEM

4.0 DOSE DATA FOR "AS-BUILT" LIQUID TREATMENT SYSTEM

4.1 INTRODUCTION

This section establishes individual and population dose data for ST. LUCIE PLANT No. 1's existing, or "as-built", liquid treatment system. To compute these doses, these additional data inputs and information were developed:

a. A general description of each of the components of the "as-built" system.

b. The liquid emission source terms for UNIT No. 1's existing system were coupled with (1) data calculated for environmental pathways involving aquatic foods and shoreline recreational activities and (2) the dilution factors and mixing ratios of the plant's liquid discharges with ocean water and used to compute individual and population dose rates. The guidelines given in the Staff's Regulatory Guide 1.109 have been used extensively in preparing these terms.

c. The individual and population dose data computed in this section can be used to demonstrate UNIT No. 1's compliance with APPENDIX I.

4.2 GENERAL DESCRIPTION OF "AS-BUILT" LIQUID TREATMENT SYSTEM

Liquid influents to the waste management system of UNIT No. 1 are segregated by chemistry and/or probable radioactivity for more efficient processing. Tritiated, hydrogenated, borated reactor coolant quality wastes of potentially high radioactivity are mainly processed in the boron recovery system. Aerated, chemically contaminated, and low radioactivity liquid wastes are received and processed separately in the liquid treatment system. FIGURES 4.2-1 and -2 show

FIGURE 4.2-1

ST. LUCIE PLANT, UNIT NO. 1: Liquid Treatment System - Shim Bleed

See FIGURE 1.B "SHIM BLEED"

of

ATTACHMENT B/SUPPLEMENT A

FIGURE 4.2-2

ST. LUCIE PLANT, UNIT NO. 1: Liquid Treatement System - Liquid Wastes

See FIGURES 1C "Liquid Wastes #1"
1D "Liquid Wastes #2"

of

ATTACHMENT B/SUPPLEMENT A

the components and flows of UNIT No. 1's liquid treatment system.

a. The Boron Recovery System (Shim Bleed): The major influent to the boron recovery system is reactor coolant liquid from the chemical and volume control system letdown that has resulted from feed and bleed operations for shutdowns, startups, and boron dilution over core life. In addition, reactor coolant quality water from valve and equipment leakoffs and from drains and valves within the containment are collected in the reactor drain tank and subsequently processed by this system. Reactor coolant water from leakoffs and drains in the reactor auxiliary building are also collected in the equipment drain tank treatment and processed by the Shim Bleed system.

The borated and hydrogenated water, either discharged through the reactor drain pumps or diverted from the chemical and volume control system tank through a diversion valve, is sent to a flash tank where dissolved hydrogen and fission gases are stripped from the liquid by a countercurrent flow of nitrogen gas and discharged to tne gas decay tanks of the gaseous waste system. The degassed liquid is automatically pumped from the flash tank to holdup tanks which provide a storage capacity large enough to accumulate a sufficient volume of liquid for processing by a boric acid concentrator (evaporator) on a batch basis.

The contents of the holdup tanks are transferred to the evaporator through a preconcentrator filter and ion exchanger into a preheater. The preheated boric acid solution is pumped into the evaporator and boiled. The boron concentration increases as water is evaporated off and, at periodic times, the concentrated fluid (bottoms) is pumped out of the evaporator into a boric acid tank for temporary storage and sampling. The recovered boric acid may then either be returned to a makeup tank for recycle or discharged to the drumming station for solidification and ultimate offsite disposal. If plant reuse is carried out, the fluid is analyzed for chemical acceptability and radioactivity levels.

b. Clean and Dirty Waste Systems: At UNIT No. 1, although separate collection tanks are provided for

these two influent streams, the clean and dirty wastes are processed through the same processing equipment. However, in the calculations used to demonstrate compliance, the two systems are treated as separate systems.

These liquid wastes contain dissolved solids and/or radioactive nuclides and are collected from either the equipment drain, chemical drain, laundry drain and/or aerated waste storage tanks. They are passed through a waste filter prior to entering the waste evaporator. Low pressure steam heats the waste solution in the evaporator to produce water vapor and liquid waste solution which pass into the vapor separator. Boric acid is scrubbed out of the water vapor by spraying recycled distillate over demisters and the water vapor condensed in a vapor condenser and cooled by a distillant cooler.

The distillate is collected and isolated in a condensate holdup (monitor) tank. After a laboratory assay has determined that the radioactivity of the distillate is low enough for discharge, the distillate is pumped at a controlled rate through a radiation monitor into the circulating water discharge. If discharge criteria are not met, the distillate is recirculated through a waste ion exchanger and returned to the condensate holdup tank for reanalysis. If discharge criteria cannot be met by processing through the waste ion exchanger, the distillate is returned to holdup tanks and/or the evaporator for further reprocessing.

Evaporator bottoms are pumped to the drumming station for solidification and disposal for burial. Solids content and specific radioactivity levels govern the discharge of evaporator bottoms.

c. Steam Generator Blowdown: Steam generator blowdown from a PWR does not contain any significant radioactivity unless there is a simultaneous release of radioactivity from steam generator tube leakage and increased fuel failures. Under normal operating conditions at UNIT No. 1, the blowdown is monitored and discharged to the circulating water system. If the radioactivity exceeds acceptable limits, the blowdown is automatically diverted to the Steam Generator Blowdown Treatment Facility and processed by filtration and a 2-stage ion exchanger train and collected in holdup tanks. The processed blowdown

is then sampled for radioactivity and either recycled to the plant or discharged through a radiation monitor to the circulating water system.

d. Turbine Building Drains: UNIT No. 1's turbine building is a completely open structure. The liquids in its drains are not treated since they contain very low levels of radioactivity, even if there has been some steam generator tube leakage. However, allowances have been taken in these compliance demonstration calculations for the contribution of this stream to total liquid discharges.

e. Laundry Wastes: These wastes (detergents and personnel hot shower wastes) are collected in the laundry drain tanks and analyzed for radioactivity. If the radioactivity does not exceed established limits, the liquid is pumped from the tanks through a filter and into the circulating water discharge. Should the radioactivity exceed permissible discharge limits, the laundry wastes are pumped to the waste evaporator for processing.

In order that information about the basic liquid treatment system could be used in developing source terms for this compliance demonstration, FIGURES 4.2-1 and -2 were reduced to the simplified schematic diagram shown in FIGURE 4.2-3.

4.3 ESTIMATED RELEASES FROM SYSTEM

The expected radioactive liquid releases from UNIT No. 1 are summarized by nuclide in TABLE 4.3-1. Developed about the assumption of 1% failed fuel, the TABLE shows the expected releases from the boron recovery system, the chemical drain tank, the equipment drain tank and the laundry drain tanks. TABLE 4.3-2 compares the total annual releases from 0.1% failed fuel with those from 1.0% failed fuel.

4.4 INPUTS TO GALE CODE FOR SOURCE TERM CALCULATIONS

Source terms for the treatment of liquid wastes at UNIT

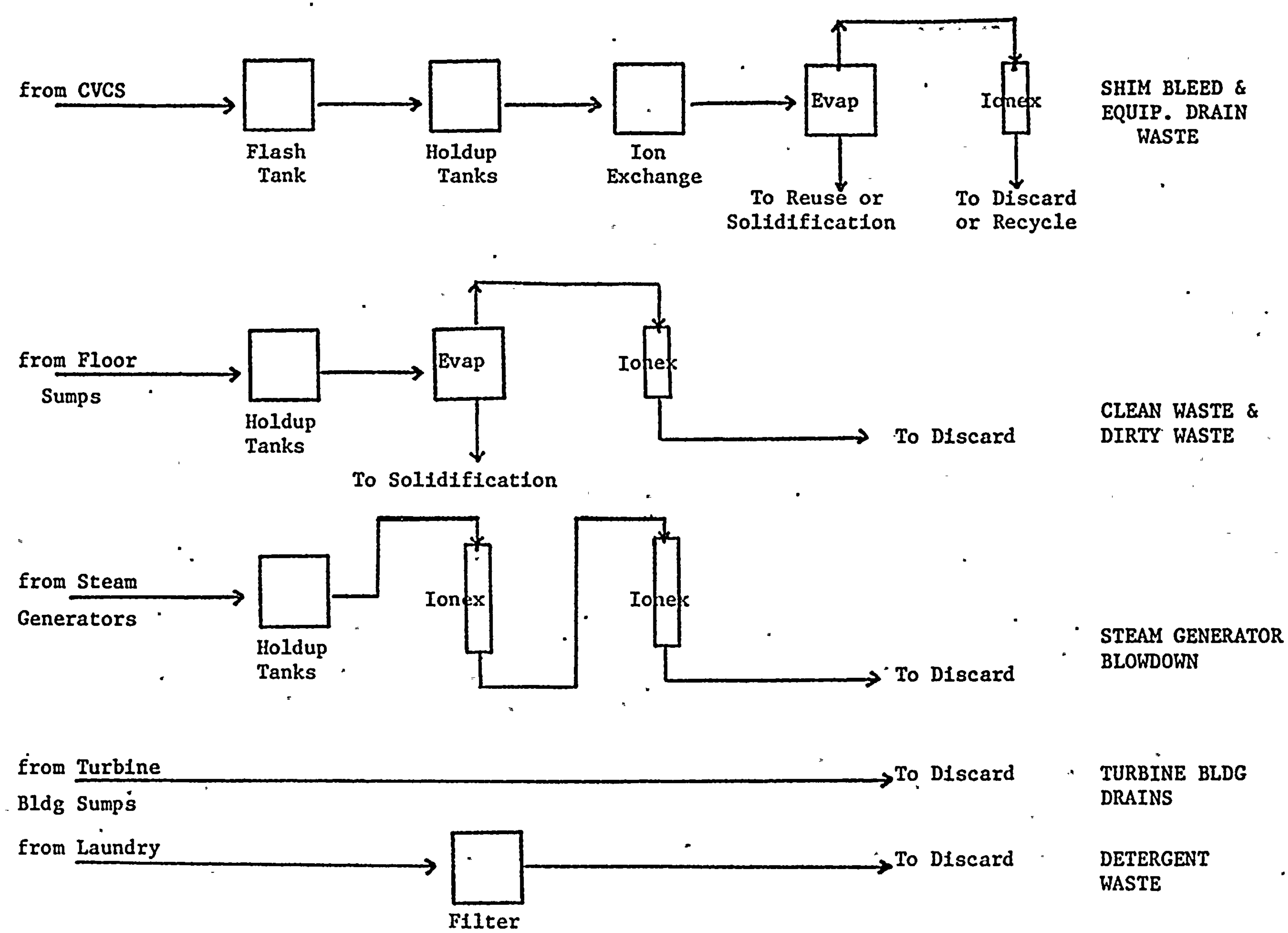

FIGURE 4.2-3

ST. LUCIE PLANT, UNIT No. 1: Liquid Waste Treatment Schematic

TABLE 4.3-1

ST. LUCIE PLANT, UNIT No. 1: Estimated Releases (Ci/yr)

From the Liquid Process Streams (For 1.0% Failed Fuel)

Nuclide	Boron Recovery System	Chemical Drain Tank	Equipment Drain Tank	Laundry Drain Tank	Total
H-3	2.3(2)*	8.6(1)	2.14(1)	5.5(-2)	339
Br-8	0.0	0.0	0.0	0.0	0.0
Kr-85m	1.1(-12)	0.0	0.0	0.0	1.1(-12)
Kr-85	3.89(2)	0.0	0.0	0.0	3.89(2)
Kr-87	0.0	0.0	0.0	0.0	0.0
Kr-88	0.0	0.0	0.0	0.0	0.0
Rb-89	0.0	0.0	0.0	0.0	0.0
Sr-89	9.6(-5)	1.7(-4)	2.1(-5)	2.39(-5)	2.7(-4)
Sr-90	5.7(-6)	1.2(-5)	2.7(-7)	2.59(-8)	1.8(-5)
Y-90	2.2(-4)	4.5(-6)	1.6(-6)	1.99(-7)	2.2(-4)
Sr-91	0.0	3.1(-7)	3.6(-8)	2.44(-8)	3.0(-7)
Y-91	2.1(-1)	4.0(-3)	2.0(-1)	6.11(-4)	2.3(-1)
Mo-99	4.4(-1)	9.6(-3)	2.9(-2)	4.17(-4)	4.9(-1)
Ru-103	7.6(-4)	1.3(-4)	2.2(-6)	1.53(-5)	9.1(-4)
Ru-106	5.4(-5)	1.1(-5)	7.9(-6)	8.53(-6)	6.5(-5)
Te-129	0.0	0.0	0.0	3.74(-14)	0.0
I-129	0.0	0.0	0.0	3.40(-11)	3.4(-9)
I-131	3.8(-5)	5.1(-2)	2.0(-3)	2.77(03)	5.2(-2)
Xe-131m	3.8(2)	1.0(1)	0.0	0.0	3.9(2)
Te-132	1.1(-2)	1.9(-3)	1.2(-4)	8.37(-5)	1.3(-3)

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TABLE 4.3-1 continued:

Nuclide	Boron Recovery System	Chemical Drain Tank	Equipment Drain Tank	Laundry Drain Tank	Total
I-132	0.0	6.0(-9)	0.0	7.12(-9)	1.1(-9)
I-133	0.0	4.2(-3)	1.5(-4)	2.12(-4)	4.3(-3)
Xe-133	2.4(4)	0.0	0.0	0.0	2.4(4)
Te-134	0.0	0.0	0.0	0.0	0.0
I-134	0.0	0.0	0.0	0.0	0.0
Cs-134	2.2(-2)	4.7(-3)	7.4(-3)	7.09(-3)	2.6(-2)
I-135		4.7(-5)	5.8(-5)	5.94(-6)	4.4(-5)
Xe-135	5.1(-7)	1.0(-8)	0.0	0.0	5.2(-7)
Cs-136	3.5(-3)	4.5(-4)	8.4(-5)	2.97(-5)	3.9(-3)
Cs-137	7.0(-2)	1.5(-2)	3.3(-1)	3.31(-1)	8.5(-2)
Xe-138	0.0	0.0	0.0	0.0	0.0
Cs-138	0.0	0.0	0.0	0.0	0.0
Ba-140	8.3(-5)	1.1(-4)	1.4(-6)	6.99(-6)	2.0(-4)
La-140	3.1(-5)	1.4(-5)	6.0(-7)	6.11(-7)	4.5(-5)
Pr-143	7.9(-4)	1.1(-4)	1.3(-6)	7.18(-6)	9.3(-4)
Ce-144	8.9(-4)	1.8(-4)	8.6(-5)	1.11(-4)	1.1(-3)
Co-60	1.1(-3)	2.5(-4)	8.8(-5)	9.37(-5)	1.4(-3)
Fe-59	4.1(05)	6.9(-6)	4.7(-7)	8.91(-8)	4.8(-5)
Co-58	9.3(-3)	1.7(-3)	1.0(-4)	3.09(-5)	1.1(-2)
Mn-54	6.1(-5)	1.2(-5)	1.8(-6)	8.08(-7)	7.2(-5)
Cr-51	6.7(-3)	1.0(-3)	5.7(-5)	9.73(-6)	7.7(-3)

TABLE 4.3-1 continued:

Nuclide	Boron Recovery System	Chemical Drain Tank	Equipment Drain Tank	Laundry Drain Tank	Total
Zr-95	1.9(-6)	3.3(-7)	2.2(-8)	5.68(-9)	2.2(-6)

*Numbers in ( ) are powers of ten.

TABLE 4.3-2

ST. LUCIE PLANT, UNIT No. 1: Estimated Total Annual Liquid Releases (Curies) For 0.1% and 1.% Failed Fuel

Nuclide	Curies Released per Year Normal Operation (0.1% Failed Fuel)	Anticipated Operation (1.0% Failed Fuel)
H-3	2.26(+2)*	3.39 (+2)
Br-8	0.0	0.0
Kr-85m	1.09(-13)	1.09 (-12)
Kr-85	3.89(+1)	3.89 (+2)
Kr-87	0.0	0.0
Kr-88	0.0	0.0
Rb-88	0.0	0.0
Rb-89	0.0	0.0
Sr-89	1.41(-5)	2.71 (-4)
Sr-90	1.29(-6)	1.80 (-5)
Y-90	2.18(-5)	2.22 (-4)
Sr-91	1.62(-12)	3.02 (-7)
Y-91	2.21(-2)	2.24 (-1)
Mo-99	4.79(-2)	4.88 (-1)
Ru-103	8.06(-5)	9.09 (-4)
Ru-106	5.89(-6)	6.47 (-5)
Te-129	0.0	5.04 (-18)
I-129	1.99(-10)	3.39 (-9)
I-131	5.14(-4)	5.22 (-3)
Xe-131m	3.87(+1)	3.87 (+2)

TABLE 4.3-2 continued:

Nuclide	Curies Released per Year Normal Operation (0.1% Failed Fuel)	Anticipated Operation (1.0% Failed Fuel)
Te-132	1.10(-3)	1.29 (-2)
I-132	0.0	1.06 (-9)
I-133	5.39(-7)	4.30 (-3)
Xe-133	2.44(+3)	2.44 (+4)
Te-134	0.0	0.0
I-134	0.0	4.68 (-20)
Cs-134	2.40(-3)	2.64 (-2)
I-135	5.57(-14)	4.36 (-5)
Xe-135	5.22(-8)	5.22 (-7)
Cs-136	3.53(-4)	3.90 (-3)
Cs-137	7.90(-3)	8.54 (-2)
Xe-138	0.0	0.0
Cs-138	0.0	0.0
Ba-140	9.67(-6)	1.95 (-4)
La-140	3.12(-6)	4.51 (-5)
Pr-143	8.30(-5)	9.27 (-4)
Ce-144	9.71(-5)	1.10 (-3)
Co-60	1.30(-3)	1.40 (-3)
Fe-59	4.24(-5)	4.78 (-5)
Co-58	9.90(-3)	1.11 (-2)
Mn-54	6.49(-5)	7.15 (-5)
Cr-51	6.90(-3)	7.70 (-3)

TABLE 4.3-2 continued:

Nuclide	Curies Released per Year Normal Operation (0.1% Failed Fuel)	Anticipated Operation (1.0% Failed Fuel)
Zr-95	1.96(-6)	2.21 (-6)
Total: H-3	2.26(+2)	3.39 (+2)
Total: Noble Gas	2.51(+3)	2.51 (+4)
Total: All Others	1.01(-1)	9.22 (-1)

*Numbers in ( ) are powers of ten.

No. 1 were calculated by the PWR-GALE Code, using the Fundamental data shown in TABLE 2.6-1 to describe UNIT No. 1's reactor and the release data that appears in TABLE 4.3-1 and the parameters outlined in Regulatory Guide 1.BB. These GALE Code input terms for the liquid treatment system are given in TABLE 4.4-1. The resulting liquid releases are shown in TABLE 4.4-2.

4.5 ENVIRONMENTAL INPUTS AND PATHWAYS

These following environmental inputs were used to convert the liquid releases tabulated in TABLE 4.4-2 into either individual or population doses:

4.5.1 Characteristics of Maximum Exposed Individual: In calculating doses to individuals maximumly exposed to the liquid discharges from ST. LUCIE PLANT, UNIT No. 1, the usage factors given in TABLE A-2 of Regulatory Guide 1.109(1) have been assumed with the following exceptions:

a. the entire shoreline recreation times have been assigned to the areas adjacent to the discharge canal where potential contamination could be greatest;

b. as an allowance for the extended benign weather conditions of the area, a similar amount of time is assumed for beach recreation;

c. the times assigned to boating were also assigned to swimming to account for similar climatic conditions; and

d. that drinking water contamination is negligible because there are no freshwater wells on the island and the groundwater flows are from west to east.

4.5.2 Mixing Ratios: For all calculations, the mixing ratios (i.e., the ratio of the concentration of radioactivity

TABLE 4.4-1

ST. LUCIE PLANT, UNIT No. 1: GALE Input Terms For

"As-Built" Liquid Treatment System

Card No.	Spaces	Entry	Item	Units	Comment(s)
15	17-33	Shim Bleed	Waste Stream		
	42-49	2482	Volume	gal/day	
	57-61	Blank	Fraction Primary Coolant Activity		
16	21-28	1E+04	I DF		
	34-41	2E+04	Cs, Rb DF's		
	47-54	1E+05	Other DF's		
17	28-33	36	Collection Time	days	
	48-53	1	Process Time	days	
	72-77	0.1	Fraction Discarded		
18	17-33	Equip Drain Waste	Waste Stream		Processed with SHIM BLEED
	42-49	200	Volume	gal/day	
	57-61	1	Fraction Primary Coolant Activity		
19	21-28	1E+04	I DF		
	34-41	2E+04	Cs, Rb DF's		
	47-54	1E+05	Other DF's		
20	28-33	36	Collection Time	days	
	48-53	1	Process Time	days	
	72-77	0.1	Fraction Discarded		
21	17-33	Clean Waste	Waste Stream		Equipment Drain Portion
	42-49	940	Volume	gal/day	
	57-61	0.071	Fraction Primary Coolant Activity		
22	21-28	1E+04	I DF		
	34-41	1E+05	Cs, Rb DF's		
	47-54	1E+05	Other DF's		

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TABLE 4.4-1 continued:

Card No.	Spaces	Entry	Item	Units	Comment(s)
23	28-33	17	Collection Time	days	
	48-53	5.5	Process Time	days	
	72-77	1	Fraction Discarded		
24	17-33	Dirty Waste	Waste Stream		Floor Drain Portion
	42-49	435	Volume	gal/day	
	57-61	0.082	Fraction Pr. Coolant Activity		
25	21-28	1E+04	I DF		
	34-41	1E+05	Cs, Rb DF's		
	47-54	1E+05	Other DF's		
26	28-33	0.9	Collection Time	days	
	48-53	0.1	Process Time	days	
	72-77	1	Fraction Discarded		
27	73-80	1	Fraction Blowdown Proc.		
28	21-28	1E+02	I DF		
	34-41	1E+02	Cs, Rb DF's		
	47-54	1E+02	Other DF's		
29	28-33	0	Collection Time	days	
	48-53	0.2	Process Time	days	
	72-77	1	Fraction Discarded		
30	73-80	Blank	Cond. Regen Waste Vol	gal/day	No Cond.Demin.
31	21-28	1	I DF		No such treatment
	34-41	1	Cs, Rb DF's		
	47-54	1	Other DF's		1 req by Code
32	28-33	0	Collection Time	days	Entry is immaterial
	48-53	0	Process Time	days	
	72-77	0	Fraction Discarded		
45	73-80	1	Detergent Waste Treatment		No treatment

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TABLE 4.4-2

ST. LUCIE PLANT, UNIT No. 1:

Liquid Releases From "As-Built" System

Isotope	Release, (Ci/yr)	Isotope	Release, (Ci/yr)
H-3	5.1E+02	Sn-117m	
Na-24	a	Te-125m	
P-32		Te-127m	5.2E-05
Cr-51	4.7E-04	Te-127	2.5E-04
Mn-54	1.1E-03	Te-129m	3.5E-04
Fe-55	4.0E-04	Te-129	3.7E-04
Fe-59	2.9E-04	Te-113m	4.4E-04
Co-58	8.1E-03	Te-131	8.1E-05
Co-60	9.2E-03	Te-132	5.7E-03
Ni-63		I-130	3.0E-04
Cu-64		I-131	8.0E-02
Br-83	1.4E-04	I-132	1.4E-02
Br-84		1-133	6.9E-02
Rb-86	2.3E-05	I=134	7.1E-05
Rb-88		I=135	1.8E-02
Sr-89	1.2E-04	Cs-134	2.0E-02
Sr-90		Cs-136	2.9E-03
Sr-91	7.0E-05	Cs-137	2.9E-02
Y-90		Ba-137m	4.4E-03
Y-91m	4.7E-5	Ba-140	5.5E-05
Y-91	1.8E-05	La-140	7.0E-05

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TABLE 4.4-2 continued

Isotope	Release, (Ci/yr)	Isotope	Release, (Ci/yr)
Y-92		Ce-141	1.8E-05
Y-93		Ce-143	
Zr-95	1.7E-05	Ce-144	5.2E-03
Zr-97		Pr-143	1.2E-05
Nb-95m		Pr-144	1.1E-05
Nb-95	1.8E-05	Nd-147	
Nb-97m		W-185	
Nb-97		W-187	
Mo-99	2.2E-02	U-237	
Tc-99m	4.5E-02	Np-239	2.3E-04
Ru-103	1.5E-04		
Ru-106		Others	2.8E-05
Rh-103m	1.4E-05		
Rh-106			

[a]No entry means the release is less than 1E-05 curies/year

the concentration of radioactivity at the point of exposure) have been conservatively estimated.

The initial mixing of the discharge canal water is accomplished off-shore by high velocity submerged jets in deep water. Based on these parametric conditions, an extremely conservative assumption was made as to the mixing of discharge water with sea water:

a. the discharge point is one-half mile offshore,

b. the average ocean depth out to one mile is 40 feet, and

c. the average flow along the shore is 1 foot per second.

It was assumed also that the discharge water was constantly diluted with a volume of water equivalent to a cross-section of 5,280 feet x 40 feet with a flow of one foot per second. Thus, the diluting water would be equal to 2.11 E+05 gpm, its mixing with this volume of water will give a ratio of 0.05. A mixing ratio of 0.1 has been used for the edge of the initial mixing zone for all individual dose parameters except "discharge canal shoreline", for which the value is 1.0.

4.5.3 Water Use: There are no water resources near UNIT No. 1 that are used as potable water sources. Therefore, no pathways involving potable water were evaluated.

4.5.4 Recreation: Swimming, boating, surfing, fishing,

and picnicing are the principal shoreline recreational activities of the area about ST. LUCIE PLANT.

TABLE 4.5.4-1 gives an estimation of the recreational use of the shoreline and the ocean areas adjacent to the plant. The survey period included one holiday and was conducted during favorable weather so that it is reasonable to assume the data presented are representative of the recreational activities on the entire beach area throughout the year. It should be noted that the recreational use of that portion of beach extending southward from the plant site is much higher than the beach areas in the immediate ST. LUCIE PLANT area and northward. TABLE 4.5.4-2 gives parameters developed to relate beach use to dose ratios and accounts for man-hours/year usage of a 100-mile area extending from 50 miles north of the plant to 50 miles south of the plant. Conservative assumptions, based on higher beach activities at greater distances (i.e., southward from the plant site to 50 miles), show that the concentrations of radioactivity in these specific areas will be much less than those that have been obtained by using a mixing ratio of 0.05 in these calculations.

4.5.5 Aquatic Food Pathways: ST. LUCIE PLANT area also supports a viable marine products industry. Some of the summaries in SUPPLEMENT B lists the various saltwater and shellfish species caught in the waters about this area. Marine

TABLE 4.5.4-1

ST. LUCIE PLANT: Beach Survey[a]

Date 1975	Day of Week	Fishermen	Bathers	Surfers	Beachcombers	Boaters	Total Persons
7/3	Th	0	0	7	0	0	7
7/4	Fr	2	26	63	14	2	107
7/5	Sa	8	15	89	15	2	129
7/6	Su	9	8	5	13	5	40
7/8	Tu	4	0	2	15	12	33
7/9	We	4	3	6	16	3	32
7/10	Th	2	11	2	22	5	42
7/11	Fr	1	0	2	12	5	20
7/12	Sa	1	2	0	22	5	30
7/13	Su	8	9	0	11	0	28
7/14	Mo	2	0	0	17	2	21
7/15	Tu	2	2	5	3	1	13
7/16	We	3	0	10	11	0	24

TABLE 4.5.4-1 continued:

Date 1975	Day of Week	Fisherman	Bathers	Surfers	Beachcombers	Boaters	Total Persons
7/18	Fr	1	6	2	5	1	15
7/19	Sa	4	5	4	13	0	26
7/20	Su	6	7	12	2	8	35
7/21	Mo	2	10	8	16	0	36
7/22	Tu	10	5	0	16	0	31
Total		69	109	217	223	51	669

[a] Survey covered about two miles of beach during the approximate hours of 0630-1700.

TABLE 4.5.4-2

ST. LUCIE PLANT, UNIT No. 1:

Parameters Used for Recreational Exposures

1. ASSUMPTIONS

   a. Average time spent in beach activity (per type indicated in TABLE 4.5.4-1): 4 hrs/visit.

   b. Conservative use of one mile for length of beach surveyed.

   c. Bathers and surfers spend 1/2 their time on beach and 1/2 in water.

2. From these assumptions and data in TABLE 4.5.4-1, total recreation =

$$\frac{144 \text{ man-hours}}{(\text{day})(\text{mile})}$$

3. Extrapolation to 50 miles North and to 50 miles South (distance = 100 miles) and 365-day/year usage of beach = 5.25E+06 manhours/year.

4. Beach use activity was assumed to have these proportions:

   a. For swimming 25%

   b. For boating 10%

   c. For beach 65%

TABLE 4.5.5-1

ST. LUCIE PLANT: Aquatic Foods Harvested

In the Vicinity of Site

County	Saltwater Fish Catch, kg	Shellfish Catch, kg
St. Lucie	1.41E+06	5.44E+03
Martin	1.16E+06	4.00E+04
Indian River	7.73E+06	1.57E+05
Brevard	1.23E+06	4.00E+05
Palm Beach	1.40E+06	9.40E+04
Total	1.3E+07	7.0E+05

landings of aquatic foods occur in five counties about the plant site, i.e., St. Lucie, Martin, Indian River, Brevard, and Palm Beach counties. TABLE 4.5.5-1 gives a summary of the aquatic foods harvested from ocean areas in the vicinity of each of these counties.

In addition to the data appearing in TABLE 4.5.5-1, these following additional inputs were used in calculating dose rates:

a. the entire catch was considered to have been caught in water having a radioactivity concentration of 0.005 that of the discharge canal;

b. 10 days, or 8.64 E+05 seconds, were used as the period of time from harvest to consumption; and

c. a food preparation modifier of 0.8 (Ref. 2).

4.5.6 <u>Other Pathways</u>: No other pathways which would be likely to produce at least 10% of the dose calculated for those pathways described above were identified for the liquid effluent discharges of UNIT No. 1.

4.6 <u>Computation of Individual Doses From Liquid Releases</u>

The liquid release data given in TABLE 4.4-2 above were combined with the environmental parameters outlined in Section 4.5 and individual doses computed by use of the LINDY code (3). Adult, teen, children and infant usage factors (expressed as either kg/yr or hr/yr) and mixing ratios are given in TABLE 4.6-1. The results of these calculations are summarized in TABLE 4.6-2.

TABLE 4.6-1

ST. LUCIE PLANT, UNIT NO. 1: Parameters Used In Calculating Doses To The Maximumly Exposed Individual From Liquid Releases

	Usage Factors					Mixing
	Adult	Teen	Child	Infant	Units	Ratio
Salt H_2O Fish	21	16	6.9	0	kg/yr	0.1
Salt H_2O Shellfish	5	3.8	1.7	0	kg/yr	0.1
Discharge Canal Shoreline	12	67	14	0	hr/yr	0.1
Ocean Shoreline	12	67	14	0	hr/yr	0.1
Swimming	52	52	29	0	hr/yr	0.1
Boating	52	52	29	0	hr/yr	0.1

TABLE 4.6-2

ST. LUCIE PLANT, UNIT No. 1: Maximum Individual Doses From Exposure

To Liquid Releases From "As-Built" System

Pathway	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	Total Body
A. FOR ADULTS								
Saltwater Fish	3.27E-04*	7.46E-04	3.39E-03	3.23E-04	2.67E-04	3.99E-04	0	5.44E-04
Shell fish	6.03E-03	7.31E-04	4.41E-03	4.63E-03	1.74E-04	2.02E-02	0	5.48E-04
Discharge Canal Shoreline	9.90E-05	9.90E-05	9.90E-05	9.90E-05	9.90E-05	9.90E-05	1.16E-04	9.90E-05
Ocean Shoreline	4.95E-05	4.95E-05	4.95E-05	4.95E-05	4.95E-05	4.95E-05	5.79E-05	4.95E-05
Swimming	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.84E-06	2.15E-06
Boating	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.42E-06	1.07E-06
Total: ADULT	6.51E-03	1.63E-03	7.96E-03	5.10E-03	5.93E-04	2.07E-02	1.78E-04	1.24E-03
B. FOR TEENAGERS								
Saltwater Fish	3.22E-04	6.74E-04	3.00E-03	2.46E-04	2.05E-04	2.69E-04	0	3.23E-04
Shellfish	9.32E-04	6.98E-04	3.98E-03	3.52E-03	1.31E-04	1.58E-02	0	5.17E-04
Discharge Canal Shoreline	5.53E-04	5.53E-04	5.53E-04	5.53E-04	5.53E-04	5.53E-04	6.47E-04	5.53E-04
Ocean Shoreline	2.76E-04	2.76E-04	2.76E-04	2.76E-04	2.76E-04	2.76E-04	3.23E-06	2.76E-04
Swimming	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.15E-06	2.84E-06	2.15E-06
Boating	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.42E-06	1.07E-06
Total: TEENAGERS	2.09E-03	2.21E-03	7.82E-03	4.60E-03	1.17E-03	1.69E-02	8.90E-04	1.67E-03

TABLE 4.6-2 continued:

Pathway	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	Total Body
C. FOR CHILDREN								
Saltwater Fish	3.84E-04	5.51E-04	3.14E-03	1.06E-04	1.41E-04	1.41E-04	0	1.71E-04
Shellfish	1.16E-03	5.84E-04	4.41E-03	1.57E-04	6.95E-05	7.00E-03	0	5.45E-04
Discharge Canal Shoreline	1.15E-04	1.15E-04	1.15E-04	1.15E-04	1.15E-04	1.15E-04	1.35E-04	1.15E-04
Ocean Shoreline	5.77E-05	5.77E-05	5.77E-05	5.77E-05	5.77E-05	5.77E-05	6.76E-05	5.77E-05
Swimming	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.58E-06	1.20E-06
Boating	5.99E-07	5.99E-07	5.99E-07	5.99E-07	5.99E-07	5.99E-07	7.91E-07	5.99E-07
Total: CHILDREN	1.72E-03	1.31E-03	7.72E-03	1.85E-03	3.86E-04	7.31E-03	2.05E-04	8.91E-04
D. FOR INFANTS								
Saltwater Fish	0	0	0	0	0	0	0	0
Shellfish	0	0	0	0	0	0	0	0
Discharge Canal Shoreline	0	0	0	0	0	0	0	0
Ocean Shoreline	0	0	0	0	0	0	0	0
Swimming	0	0	0	0	0	0	0	0
Boating	0	0	0	0	0	0	0	0
Total: INFANTS	0	0	0	0	0	0	0	0

*All values in mrem/year

4.7 COMPUTATION OF POPULATION DOSES FROM LIQUID RELEASES

Five liquid pathways have been evaluated in determining population doses from liquid discharges from ST. LUCIE PLANT No. 1. These were: (a) consumption of saltwater fish, (b) consumption of saltwater shellfish, (c) exposure from shoreline residues, (d) swimming, and (e) boating. Data for the fish catches appear in TABLE 4.5.5-1; the recreational parameters were established in Paragraph 4.5.4 and TABLES 4.5.4-1 and -2. All population doses were computed using the LIP code (3). These doses are summarized in TABLE 4.7-1.

4.8. REFERENCES

1. U. S. Nuclear Regulatory Commission, Office of Standards Development, RG 1.109 "Calculation of Annual Average Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, APPENDIX I," March, 1976.

2. J. E. Fletcher, et al., "HERMES-Digital Computer Code for Estimating Regional Radiological Effects from the Nuclear Power Industry," HEDL-TME-71-68, December, 1971.

3. Constructed by NUCLEAR SAFETY ASSOCIATES, 5101 River Road Bethesda, M.D.

TABLE 4.7-1

ST. LUCIE PLANT, UNIT No. 1: Population Doses From Liquid Effluents Released By "As-Built" Liquid Treatment System

	Population Doses mrem/yr		
	Thyroid	Total Body	Total
Saltwater Fish	4.19E-02	1.28E-02	5.47E-02
Saltwater Shellfish	1.15E-02	1.43E-03	1.29E-02
Ocean Shoreline Deposits	7.06E-04	7.06E-04	1.41E-03
Swimming	2.71E-06	2.71E-06	5.42E-06
Boating	5.42E-07	5.42E-07	1.08E-06
Total Liquid Population Dose	5.41E-02	1.49E-02	6.80E-02

SECTION 5.0

COMPLIANCE OF "AS-BUILT" SYSTEMS WITH NRC STAFF POSITION ON APPENDIX I

5.0 COMPLIANCE OF "AS-BUILT" WASTE SYSTEMS WITH NRC STAFF POSITION ON APPENDIX I

ST. LUCIE PLANT, UNIT No. 1 is in compliance with the requirements of APPENDIX I. The following summations show that the plant meets, with a considerable margin of safety, the design guides of Paragraphs II A, B and C of APPENDIX I.

5.1 COMPLIANCE ON INDIVIDUAL DOSES

A comparison (TABLE 5.1-1) of the individual doses computed in Sections 3 and 4 above with APPENDIX I requirement shows that the "as-built" gaseous and liquid treatment systems are effective systems for control of radioactive releases.

5.2 COMPLIANCE ON POPULATION DOSES

In like manner, the residual population doses, which might result from the operation of the "as-built" systems over the lifetime of the plant, are well within the requirements of APPENDIX I. TABLE 5.2-1 compares dose values based on the 1980 population within 50 miles of the plant with those based on the area's 2020 population, an estimated population increase 4 x's that of 1980.

5.3 COMPLIANCE WITH MORE THAN ONE REACTOR ON SITE

TABLE 5.3-1 augments data compiled for UNIT No. 1 with that obtained in similar computations (1) for ST. LUCIE PLANT, UNIT No. 2, which will become an active power-producing reactor in the 1980's, to show that ST. LUCIE PLANT site will

TABLE 5.1-1

ST. LUCIE PLANT, UNIT No. 1: Compliance With APPENDIX I-Comparison of Doses To Individuals

Releases	Total Body Compliance PSL	Total Body APPENDIX I	Thyroid Compliance PSL	Thyroid APPENDIX I	Skin Compliance PSL	Skin APPENDIX I	GI Tract Compliance PSL	GI Tract APPENDIX I
A. Doses to ADULTS, mrem/year								
a) Liquid-to Max. Exposed Individual	1.20E-02	3.0E 00	7.96E-03	1.0E+01	1.78E-04	1.0E+01	2.07E-02	1.0E+01
b) Gaseous-to Individual at Nearest Residence, 1.9 miles WSW	9.10E-02	5.0E 00	5.40E-01	1.5E+01	2.43E-01	1.5E+01	9.1E-02	1.5E+01
c) Gaseous-to Individual at Nearest Cow, 7.5 miles SSW	6.10E-03	5.0E 00	1.00E-01	1.5E+01	1.60E-02	1.5E+01	6.1E-03	1.5E+01
d) Gaseous-to Hypothetical Individual at Site Boundary, 1 mile N	3.03E-01	5.0E 00	5.36E-01	1.5E+01	8.11E-01	1.5E+01		
B. Doses to CHILDREN, mrem/year								
a) Liquid-to Max. Exposed Individual	1.20E-02	3.0E 00	5.30E-02	1.0E+01	6.9E-03	1.0E+01	4.0E-02	1.0E+01
b) Gaseous-to Individual at Nearest Residence, 1.9 miles WSW	9.10E-02	5.0E 00	5.10E-01	1.5E+01	2.43E-01	1.5E+01	9.1E-02	1.5E+01
c) Gaseous-to Individual at Nearest Cow, 7.5 miles SSW	6.10E-03	5.0E 00	8.30E-01	1.5E+01	1.60E-02	1.5E+01	6.70E-02	1.5E+01
d) Gaseous-to Hypothetical Individual at Site Boundary, 1 mile N	3.03E-01	5.0E 00	8.78E-01	1.5E+01	8.11E-01	1.5E+01		

TABLE 5.2-1

ST. LUCIE PLANT, UNIT No. 1: Comparison of Population Doses -

1980 Population Data vs 2020 Population Data*

Pathway	Dose, mrem/year Thyroid	Total Body	Total Dose
A. Releases To 1980 Population			
1. Liquid Releases	5.4E-02	1.5E-02	6.9E-02
2. Gaseous Releases	7.47E 00	4.8E 00	1.23E+01
TOTAL Releases	7.52E 00	4.83E 00	1.24E+01
B. Releases To 2020 Population			
1. Liquid Releases	5.4E-02	1.5E-02	6.9E-02
2. Gaseous Releases	1.12E+01	7.73E 00	1.9E+01
TOTAL Releases	1.13E+01	7.75E 00	1.91E+01

*Over plant lifetime

TABLE 5.3-1

ST. LUCIE PLANT: Site Compliance With NRC Staff Position

On APPENDIX I (With 2 Reactors In Operation)

Pathway	UNIT No. 1 Release	UNIT No. 2 Release	Site Release	NRC Staff Position (RM-50-2)
a) Gaseous Releases:				
1. Air Dose at Site Boundary				
a. Gamma, mrad/yr	5.7E-01	5.7E-01	1.1E 00[a]	10 per site
b. Beta, mrad/yr	1.7E 00	1.7E 00	3.4E 00[a]	20 per site
2. Air Immersion of Individual				
a. Total Body, mrem/yr	6.3E-02	6.3E-02	1.3E-01[a]	5 per site
b. Skin, mrem/yr	7.8E-02	7.8E-02	1.6E-01	10 per site
3. From Iodines and Particulates				
a. Total Body, mrem/yr	1.9E-01	1.9E-01	3.8E-01[a]	5 per site
b. Thyroid, mrem/yr	3.4E-01	3.4E-01	6.8E-01[a]	15 per site
c. Total I-131 Release, Ci/yr	8.0E-02	8.0E-02	1.6E-01	1 per unit
b) Liquid Releases				
1. Total Body Dose To Individual, mrem/yr	1.2E-03	1.2E-03	1.2E-03[b]	5 per site
2. Dose To Any Organ, mrem/yr	2.1E-02	2.1E-02	2.1E-02[b,c]	5 per site
3. Total liquid Release, Ci/yr	3.4E-01	3.4E-01	6.8E-01	5 per unit

[a] A conservative assumption that doses are completely additive.

[b] Liquid doses are not additives, since liquid doses are concentration dependants and each unit has its own dilution water.

[c] GI-LLI of adult is the critical pathway.

[d] Except ^{3}H and dissolved noble gases.

be in compliance with the NRC Staff position on APPENDIX I (RM-50-2) even with 2 operating reactors. UNIT No. 2's "as-built" systems are identical to those of UNIT No. 1.

5.4 CONCLUSIONS

It is clear from the above tabulations that the equipment of the "as-built" systems at UNIT No. 1 can adequately maintain the dose requirements of APPENDIX I. No presently calculated individual dose exceeds 4% of its APPENDIX I limit to any existing resident nor 10% to the hypothetical resident on the northern site boundary.

Our option to dispense with meeting the requirements of Paragraph IID of APPENDIX I(the cost benefit analysis) has been met with the findings reported above. We believe that the gaseous waste and liquid treatment equipment installed in UNIT No. 1 have gone far beyond the point of cost effectiveness. UNIT No. 1 is over-equipped to meet APPENDIX I compliance. However, no modifications to either effluent treatment system is required or planned.

5.5 REFERENCES

1. Completed under contract with NUCLEAR SAFETY ASSOCIATES, Bethesda, Maryland; A document covering this work will be issued in June, 1976.

SECTION 6.0

COST-BENEFICIAL ANALYSIS OF ALTERNATE GASEOUS WASTE AND LIQUID TREATMENT SYSTEMS

6.0 COST-BENEFICIAL ANALYSIS OF ALTERNATE GASEOUS WASTE AND LIQUID TREATMENT SYSTEMS

6.1 INTRODUCTION

On September 4, 1975, the NRC published in the FEDERAL REGISTER an amendment to APPENDIX I which permits an applicant, whose application was filed prior to June 4, 1976 and subsequent to January 2, 1970, the option to dispense with meeting the requirements of Paragraph II D of APPENDIX I, if he can show that his plant meets the final staff position on APPENDIX I. This option does not in anyway affect the need to show compliance with Paragraphs II A, B, and C.

ST. LUCIE PLANT, UNIT No. 1's "as-built" gaseous waste and liquid treatment systems have been demonstrated in Sections 3.0 and 4.0 above, to be in compliance with Paragraphs II A, B, and C. The plant is also in compliance with Paragraph II D. However, in order to emphasize the importance of this compliance, FPL has elected to consider alternative systems. Thus, the cost-benefit data that follow for these gaseous and liquid systems add considerably to the conclusions given in Section 5.0, above.

6.2 BASES FOR COST-BENEFIT ANALYSES

In order to carry out the sequential cost-benefit analysis required by Paragraph II D of APPENDIX I, it was necessary to evaluate the addition or subtraction of a component from a system with respect to these principal costs:

a. The capital and operating costs associated with the described change, and

b. The resulting costs that could arise from increasing the capability of the system to meet more stringent environment requirements to reduce environmental doses.

In our evaluation of each alternative system, estimations have been made of the capital and operating costs associated with each described change. The capital costs have been annualized and added to the annual operating costs to arrive at a total annual cost. Additional augments to the system increase these annual costs, which in turn must be compared to the savings in environmental costs that result from population dose reductions. In those cases where equipment is removed, the resulting costs are cost savings that must be compared to the increases in environmental cost which result from environmental increases. Under these conditions, the test is whether or not the ratio of the annual cost in dollars to the annual change in dose in man-rem shows an increase that is greater than $1,000.

Most of the cost estimates used in this evaluation of alternative systems are based on values given in Regulatory Guide 1.110. In those instances where it was necessary to use other sources of cost data and other methods of cost estimating, an appropriate indication of the source is shown. SUPPLEMENT C describes the cost estimating methodology used in these analyses and provides detailed cost estimates for

use in computation.

6.3 COST-BENEFICIAL ALTERNATIVES FOR THE GASEOUS WASTE SYSTEM

In our evaluation of cost-beneficiality, we have evaluated nine (9) different alternate systems for Unit No. 1's existing system. The components affected and the changes made were these:

System Designation	Components of Waste System Affected	Description of Change
C-1	Gas Decay Train	Add one decay tank
C-2	Gas Decay Train	Increase size of gas decay tank (by 33%)
C-3	Gas Decay Train	Add HEPA Filters
D-1	Aux. Bldg. Ventilation	Add charcoal adsorbers
D-2	Aux. Bldg. Ventilation	Remove HEPA Filters
E-1	Containment Purge	Remove kidney
E-2	Containment Purge	Add charcoal adsorbers
E-3	Containment Purge	Remove HEPA Filters
F-1	Condenser Air Ejector	Add charcoal adsorbers

6.3.1 Inputs To GALE Code and Source Terms:

The fundamental input terms which describe UNIT No. 1's reactor (See TABLE 2.6) also are applicable to each of these alternate systems. The GALE input terms specific to each system are shown in TABLE 6.3.1-1.

The gaseous emission source terms for each of these systems were calculated using the PWR-GALE Code and the parameters outlined in Regulatory Guide 1.BB. The resulting source term for each radionuclide shown in TABLE 6.3.1-2, represents the difference between its release by the "as-built" system and its release by the substitute system. It should be noted that when an augment is added to the system, the nuclide release dif-

TABLE 6.3.1-1

ST. LUCIE PLANT, UNIT No. 1: GALE Input Terms

For Alternative Gaseous Waste Systems

System Designation	Purpose	Changes Required Card No.	Lines	Entry
C-1	Add 1 Decay Tank	34	73-80	18.6
		35	73-80	18.6
C-2	Increase Gas Decay Tank Volumes By 1/3	34	73-80	12.5
		35	73-80	12.5
		36	73-80	12.5
C-3	Add HEPA To Gas Decay Release	37	39-41	yes
D-1	Add Charcoal Adsorber To Aux. Building	38	39-41	yes
D-2	Remove HEPA From Aux. Building	38	56-58	Leave Blank
E-1	Remove Kidney From Containment	40	73-80	0
E-2	Add Charcoal Adsorbers To Purge	41	47-49	yes
E-3	Remove HEPA From Purge	41	56-58	Leave Blank
F-1	Add Charcoal Adsorbers To Condenser Air Ejector	44	73-80	0.1

TABLE 6.3.1-2

ST. LUCIE PLANT, UNIT No. 1: Reduction (or Increase) Resulting From Potential Use of Alternative Gaseous Waste Treatment Systems

Part 1: Plant Vent Releases

Changes In Release For Change Indicated (Curies/Year)

Nuclide	C-1 Add 1 Decay Tank	C-2 Increase Decay Tank Size	C-3 Add HEPA To Gas Decay Tank	D-1 Add Charcoal Adsorber To Aux. Bldg.	D-2 Remove HEPA From Aux. Bldg.	E-1 Remove Kidney From Containment	E-2 Add Charcoal Adsorber To Purge	E-3 Remove HEPA From Purge	F-1 Add Charcoal Adsorbers To CAE
Kr-83m	0	0	0	0	0	0	0	0	0
Kr-85m									
Kr-85									
Kr-87									
Kr-88									
Kr-89	0	0							
Xe-131m	-8.3E+01	-4.1E+01							
Xe-133m	-4.0E+01	-3.0E+01							
Xe-133	-1.4E+04	-9.3E+03							
Xe-135m	0	0							
Xe-135									
Xe-137									
Xe-138									
A-41									
C-14				0		0	0		
I-131				-5.3E-02		+1.9E-01	-6.9E-03		
I-133			0	-6.5E-02	0	+5.8E-02	-6.2E-03	0	
Mn-54			-4.5E-03	0	+1.8E-02	+2.1E-04	0	+5.9E-04	
Fe-59	0	0	-1.5E-03	0	+5.9E-03	+7.3E-05	0	+2.0E-04	0

TABLE 6.3.1-2 continued:

Nuclide	C-1 Add 1 Decay Tank	C-2 Increase Decay Tank Size	C-3 Add HEPA To Gas Decay Tank	D-1 Add Charcoal Adsorber To Aux. Bldg.	D-2 Remove HEPA From Aux. Bldg.	E-1 Remove Kidney From Containment	E-2 Add Charcoal Adsorber To Purge	E-3 Remove HEPA From Purge	F-1 Add Charcoal Adsorbers To CAE
Co-58	0	0	-1.5E-02	0	+5.9E-02	+7.3E-04	0	+2.0E-03	0
C0-60			-6.9E-03		+2.7E-02	+3.3E-04		+9.1E-04	
Sr-89			-3.3E-03		+1.3E-03	+1.7E-05		+4.6E-05	
Sr-90			-5.9E-05		+2.4E-04	+2.9E-06		+8.0E-06	
Cs-134			-4.5E-03		+1.8E-02	+2.1E-04		+5.9E-04	
Cs-137			-7.4E-03		+3.0E-02	+3.7E-05		+9.9E-04	
H-3			0	0	0	0	0	0	0

Part 2: STEAM JET AIR EJECTOR/TURBINE BUILDING RELEASES

Changes In Release For Change Indicated (Curies/Year)

Kr-83m			0	0	0	0	0	0	0
Kr-85m									
Kr-85									
Kr-87									
Kr-88									
Kr-89									
Xe-131m									
Xe-133m									
Xe-133									
Xe-135m									
Xe-135									
Xe-137									
Xe-138	0	0	0	0	0	0	0	0	0

TABLE 6.3.1-2 continued:

Nuclide	C-1 Add 1 Decay Tank	C-2 Increase Decay Tank Size	C-3 Add HEPA To Gas Decay Tank	D-1 Add Charcoal Adsorber To Aux. Bldg.	D-2 Remove HEPA From Aux. Bldg.	E-1 Remove Kidney From Containment	E-2 Add Charcoal Adsorber To Purge	E-3 Remove HEPA From Purge	F-1 Add Charcoal Adsorbers To CAE
A-41	0	0	0	0	0	0	0	0	0
C-14									0
I-131									-3.4E-02
I-133									-4.1E-02
Mn-54									0
Fe-59									
Co-58									
Co-60									
Sr-89									
Sr-90									
Cs-134									
Cs-137									
H-3	0	0	0	0	0	0	0	0	0

ference will be positive which represents a reduction in release. The elimination of an augment will result in a negative difference, or an increase in release. The GALE code inputs, describing the releases that could occur from either the PLANT or STEAM JET AIR/EJECTOR/TURBINE BUILDING vents for each of these alternate systems, appear in Parts 1 and 2, respectively, of TABLE 6.3.1-2.

6.3.2 Changes In Population Doses For Alternate Gaseous Systems: To determine the population doses that could result from each of these gaseous systems, the food pathway and the 1980 and 2020 population data considered for the "as-built" system were coupled with the source terms developed for each specific system described in Paragraph 6.3.1 above. The GASP code (1) was used to compute these doses.

TABLE 6.3.2-1 compares the reductions in population doses that are potentially possible if any of these substitute systems are used for gaseous waste treatment at ST. LUCIE PLANT, UNIT No. 1.

6.3.3 Annualized Costs of Alternate Systems: TABLE 6.3.3-1 summarizes the annual increased costs or the savings that could result from the use of a specific alternate system. PART I, SUPPLEMENT C, gives details about the cost estimates developed to compute these costs.

TABLE 6.3.2-1

ST. LUCIE PLANT, UNIT No. 1: Reduction of Population Doses Through Use of Selected Alternative Gaseous Waste Treatment Systems

Pathway	System-Dose Rate*	C-1: Add One Decay Tank			C-2: Increase Decay Tank Sizes		
		Thyroid	Body	Total	Thyroid	Body	Total
A. For 1980 (FPL) Population							
1) Food Pathways							
Fruit & Vegetables		0	0	0	0	0	0
Meat		0	0	0	0	0	0
Milk		0	0	0	0	0	0
Total-Food Pathways		0	0	0	0	0	0
2) Population Pathways							
Noble Gas Immersion		+5.0E-01	+5.0E-01	+1.0E 00	+3.31E-01	+3.3E-01	+6.6E-01
Ground Plane Deposition		0	0	0	0	0	0
Inhalation		0	0	0	0	0	0
Total-Pop. Pathways		+5.0E-01	+5.0E-01	+1.0E 00	0	0	0
3) TOTAL 1980 Dose Change		+5.0E-01	+5.0E-01	+1.0E 00	+3.31E-01	+3.3E-01	+6.6E-01

*Dose Rate = man-rem/year

– Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 Continued:

Pathway	System-Dose Rate*	C-1: Add One Decay Tank Thyroid	C-1: Body	C-1: Total	C-2: Increase Decay Tank Sizes Thyroid	C-2: Body	C-2: Total
B. For 2020 (NRC) Population							
1) Total Food Pathways (Same as those for 1980)		0	0	0	0	0	0
2) Population Pathways							
Noble Gas Immersion		+1.9E 00	+1.9E 00	+3.9E 00	+1.2E 00	+1.2E 00	+2.4E 00
Ground Plane Deposition		0	0	0	0	0	0
Immersion		0	0	0	0	0	0
Total-Pop. Pathways		+1.9E 00	+1.9E 00	+3.9E 00	+1.2E 00	0	0
3) TOTAL 2020 Dose Change		+1.9E 00	+1.9E 00	+3.9E 00	+1.2E 00	+1.2E 00	+2.4E 00

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

System-Dose Rate* Pathway	C-3: Add HEPA To Gas Decay Tank Thyroid	Body	Total	D-1: Add Charcoal Adsorbers To Aux. Bldg. Thyroid	Body	Total
A. For 1980 (FPL) Population						
1) Food Pathways						
Fruits & Vegetables	0	+7.4E-02	+7.4E-02	+4.5E-01	+9.1E-04	+4.5E-01
Meat	0	+1.6E-03	+1.6E-03	+1.3E-02	+2.5E-05	+1.3E-02
Milk	0	+1.2E-02	+1.2E-02	+7.0E-01	+1.5E-03	+7.0E-01
Total-Food Pathways	0	+8.8E-02	+8.8E-02	+1.2E 00	+2.4E-03	+1.2E 00
2) Population Pathways						
Noble Gas Immersion	0	0	0	+2.5E-08	+2.5E-08	+5.0E-08
Ground Plane Deposition	+9.0E-02	+9.0E-02	+1.8E-01	+1.8E-04	+1.8E-04	+3.6E-04
Inhalation	0	+8.4E-04	+8.4E-04	+1.5E-01	+2.8E-04	+1.5E-01
Total-Pop. Pathways	+9.0E-02	+9.1E-02	+1.8E-01	+1.5E-01	+4.6E-04	+1.5E-01
3) TOTAL 1980 Dose Change	+9.0E-02	+1.8E-01	+2.7E-01	+1.3E 00	+2.9E-03	+1.3E 00

*Dose Rate = man-rem/year

– Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	C-3: Add HEPA To Gas Decay Tank Thyroid	Body	Total	D-1: Add Charcoal Adsorbers To Aux. Bldg. Thyroid	Body	Total
B. For 2020 (NRC) Population						
1) Total-Food Pathways (same as those for 1980)	0	+8.8E-02	+8.8E-02	+1.2E 00	+2.4E-03	+1.2E 00
2) Population Pathways						
Noble Gas Immersion	0	0	0	+8.8E-08	+8.8E-08	+1.8E-07
Ground Plane Deposition	+3.5E-01	+3.5E-01	+7.0E-01	+7.2E-04	+7.2E-04	+1.4E-03
Inhalation	0	+3.1E-03	+3.1E-03	+5.6E-01	+1.0E-03	+5.6E-01
Total-Pop. Pathways	+3.5E-01	+3.5E-01	+7.1E-01	+5.6E-01	+1.7E-03	+5.6E-01
3) TOTAL 2020 Dose Change	+3.5E-01	+4.4E-01	+8.0E-01	+1.8E 00	+4.1E-03	+1.8E 00

Column header: System-Dose Rate*

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate*	D-2: Remove HEPA From Aux. Bldg. Thyroid	D-2: Body	D-2: Total	E-1: Remove Kidney From Ion Purge Thyroid	E-1: Body	E-1: Total
A. For 1980 (FPL) Population							
1) Food Pathways							
Fruits & Vegetables		0	-3.0E-01	-3.0E-01	-1.6E 00	-6.8E-03	-1.6E 00
Meat		0	-6.3E-03	-6.3E-03	-4.5E-02	-1.6E-04	-4.5E-02
Milk		0	-4.9E-02	-4.9E-02	-2.5E 00	-5.7E-03	-2.5E 00
Total-Food Pathways		0	-3.5E-01	-3.5E-01	-4.1E 00	-1.3E-02	-4.1E 00
2) Population Pathways							
Noble Gas Immersion		0	0	0	-2.3E-08	-2.3E-08	-4.6E-08
Ground Plane Deposition		-3.5E-01	-3.5E-01	-7.0E-01	-4.9E-03	-4.9E-03	-9.8E-03
Inhalation		0	-3.7E-03	-3.7E-03	-4.4E-01	-8.1E-04	-4.4E-01
Total-Pop. Pathways		-3.5E-01	-3.6E-01	-7.1E-01	-4.5E-01	-5.6E-03	-4.5E-01
3) TOTAL 1980 Dose Change		-3.5E-01	-7.1E-01	-1.1E 00	-4.5E 00	-1.8E-02	-4.5E 00

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

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TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate*	D-2: Remove HEPA From Aux. Bldg.			E-1: Remove Kidney From Ion Purge		
		Thyroid	Body	Total	Thyroid	Body	Total
B. For 2020 (NRC) Population							
1) Total Food Pathways (same as those for 1980)		0	-3.5E-01	-3.5E-01	-4.1E 00	-1.3E-02	-4.1E 00
2) Population Pathways							
Noble Gas Immersion		0	0	0	-7.9E-08	-7.9E-08	-1.6E-07
Ground Plane Deposition		-1.4E 00	-1.4E 00	-2.8E 00	-1.9E-02	-1.9E-02	-3.9E-02
Inhalation		0	-1.2E-02	-1.2E-02	-1.6E 00	-3.2E-03	-1.6E 00
Total-Pop. Pathways		-1.4E 00	-1.4E 00	-2.8E 00	-1.6E 00	-2.3E-02	-1.7E 00
3) TOTAL 2020 Dose Change		-1.4E 00	-1.7E 00	-3.1E 00	-5.8E 00	-3.6E-02	-5.8E 00

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate*	E-2: Add Charcoal Ads. to Purge			E-3: Remove HEPA From Purge		
		Thyroid	Body	Total	Thyroid	Body	Total
A. For 1980 (FPL) Population							
1) Food Pathways							
Fruits & Vegetables		+5.6E-02	+1.1E-04	+5.6E-02	0	-9.9E-03	-9.9E-03
Meat		+1.6E-03	+3.1E-06	+1.6E-03	0	-2.1E-04	-2.1E-04
Milk		+8.8E-02	+1.8E-04	+8.8E-02	0	-1.6E-03	-1.6E-03
Total-Food Pathways		+1.5E-01	+3.0E-04	+1.5E-01	0	-1.2E-02	-1.6E-03
2) Population Pathways							
Noble Gas Immersion		+2.4E-09	+2.4E-09	+4.8E-09	0	0	0
Ground Plane Deposition		+2.3E-05	+2.2E-05	+4.5E-05	-1.2E-02	-1.2E-02	-2.4E-02
Inhalation		+1.8E-02	+3.3E-05	+1.8E-02	0	-1.1E-04	-1.1E-04
Total-Pop. Pathways		+1.8E-02	+5.5E-05	+1.8E-02	-1.2E-02	-1.2E-02	-2.4E-02
3) TOTAL 1980 Dose Change		+1.6E-01	+3.6E-04	+1.7E-02	-1.2E-02	-2.4E-02	-3.6E-02

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate*	E-2: Add Charcoal Ads. to Purge			E-3: Remove HEPA From Purge		
		Thyroid	Body	Total	Thyroid	Body	Total
B. For 2020 (NRC) Population							
1) Total Food Pathways (same as those for 1980)		+1.5E-01	+3.0E-04	+1.5E-01	0	-1.2E-02	-1.2E-03
2) Population Pathways							
Noble Gas Immersion		+8.5E-09	+8.5E-09	+1.6E-08	0	0	0
Ground Plane Deposition		+8.8E-05	+8.8E-05	+1.8E-04	-4.7E-02	-4.7E-02	-9.4E-02
Inhalation		+6.7E-02	+1.2E-04	+6.7E-02	0	-4.1E-04	-4.1E-04
Total-Pop. Pathways		+6.7E-02	+2.1E-04	+6.7E-02	-4.7E-02	-4.7E-02	-9.4E-02
3) TOTAL 2020 Dose Change		+2.2E-01	+5.1E-04	+2.2E-01	-4.7E-02	-5.9E-02	-1.1E-02

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate*	F-1: Add Charcoal Ads. To Air Ejector		
		Thyroid	Body	Total
A. For 1980 (FPL) Population				
1) Food Pathways				
Fruits & Vegetables		+3.7E-01	+7.5E-04	+3.7E-01
Meat		+9.6E-03	+1.8E-05	+9.6E-03
Milk		+5.0E-01	+1.0E-03	+5.0E-01
Total-Food Pathways		+8.8E-01	+1.8E-03	+8.8E-01
2) Population Pathways				
Noble Gas Immersion		+2.0E-08	+2.0E-08	+2.0E-08
Ground Plane Deposition		+1.7E-04	+1.7E-04	+3.4E-04
Inhalation		+1.1E-01	+2.0E-04	+1.1E-01
Total- Population Pathways		+1.1E-01	+3.7E-04	+1.1E-01
3) TOTAL 1980 Dose Change		+9.9E-01	+2.2E-03	+9.9E-01

*Dose Rate = man-rem/year

-Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.2-1 continued:

Pathway	System-Dose Rate* Thyroid	Body	Total
B. For 2020 (NRC) Population			
1) Total Food Pathways (same as those for 1980)	+8.8E-01	+1.8E-03	+8.8E-01
2) Population Pathways			
Noble Gas Immersion	+7.0E-08	+7.0E-08	+1.4E-07
Ground Plane Deposition	+6.6E-04	+6.6E-04	+1.3E-03
Inhalation	+4.0E-01	+7.3E-04	+4.0E-01
Total-Population Pathways	+4.0E-01	+1.4E-03	+4.0E-01
3) TOTAL 2020 Dose Change	+1.3E 00	+3.2E-03	+1.3E-03

*Dose Rate = man-rem/year

- Values are increases in dose rate; + values are decreases in dose rate.

TABLE 6.3.3-1

ST. LUCIE PLANT, UNIT No. 1: Annual Costs of Alternate Gaseous Waste Systems

System Designation	Purpose	Cost $/year[a]
C-1	Add One Gas Decay Tank	7,200
C-2	Increase Size Decay Tanks	4,100
C-3	Add HEPA To Gas Decay Train	7,500
D-1	Add Charcoal to Aux. Bldg.	111,200
D-2	Remove HEPA from Aux. Bldg.	(105,200)[b]
E-1	Remove Kidney	(64,900)
E-2	Add Charcoal to High Vol. Purge	47,300
E-3	Remove HEPA from High Vol. Purge	(52,500)
F	Add Charcoal to Condenser Air Ejector	12,700

[a]See Part II, ATTACHMENT C, for details for cost estimating.

[b]Values in ( ) are cost savings.

6.3.4 Cost-Benefit Ratios of Alternate Systems: As it has been described in 6.2 above, a cost-benefit ratio for each system can be derived through a simple proportionality statement, i.e. -

$$\frac{\text{Annual Costs In Dollars}}{\text{Annual Change In Dose (man-rem)}} = \$ \text{ of Cost-Benefit}$$

Cost-benefit ratio values, based on 1980 population data, for each of the alternative gaseous systems have been calculated in this manner and are listed in TABLE 6.3.4-1.

6.4 COST-BENEFICIAL ALTERNATIVES FOR THE LIQUID TREATMENT SYSTEM

A similar approach was used to determine the potential cost-benefits that could result if the "as-built" liquid treatment system was replaced with one of these alternate systems:

System Designation	Component of System Affected	Description of Change
G-1	Steam Generator Blowdown Treatment	Remove cation bed
G-2	Steam Generator Blowdown Treatment	Remove mixed bed
G-3	Steam Generator Blowdown Treatment	Discard SGB Treatment
H-2	Clean Waste System	Remove evaporator
H-3	Clean Waste System	Remove demineralizer
H-4	Clean Waste System	Increase tankage
H-5	Clean Waste System	Remove evaporator and increase tankage
J-2	Dirty Waste System	Remove evaporator
J-3	Dirty Waste System	Remove demineralizer
J-4	Dirty Waste System	Increase tankage
J-5	Dirty Waste System	Remove evaporator and increase tankage
I	Laundry Waste System	Add reverse osmosis for detergents

TABLE 6.3.4-1

ST. LUCIE PLANT, UNIT No. 1: Cost-Benefit Ratios For Alternate Gaseous Waste Systems

System Designation	Purpose	Annual dose man-rem[a]	Annual cost dollars[b]	Cost-Benefit Ratios: $Cost per Man-rem Saved	Cost-Benefit Ratios: $Saved Per Man-rem Increase
C-1	Add One Gas Decay Tank	1.00E 00	7,200	7.2E+03	
C-1	Increase Size Gas Decay Tanks	6.62E-01	4,100	6.2E+03	
C-3	Add HEPA to Gas Decay	2.68E-01	7,500	2.8E+04	
D-1	Add Charcoal to Aux. Bldg.	1.31E 00	111,200	8.5E+04	
D-2	Remove HEPA from Aux. Bldg.	(1.06E 00)[c]	(105,200)[d]		1.0E+05
E-1	Remove Kidney	(4.53E 00	(64,900)		1.4E+04
E-2	Add Charcoal to Purge	1.65E-01	47,300	2.9E+05	
E-3	Remove HEPA from Purge	(3.56E-02)	(52,500)		1.5E+06
F	Add Charcoal to Cond. Air Ejector	9.88E-01	12,700		1.3E+04

[a] From TABLE 6.2.2-1

[b] From TABLE 6.2.3-1

[c] Values for ( ) in this column are dose increases.

[d] Values for ( ) in this column are cost savings.

6.4.1 Inputs To GALE Code and Source Terms: The GALE input terms that relate the fundamental terms used to describe UNIT No. 1's reactor (see TABLE 2.6) to these alternate systems are given in TABLE 6.4.1-1.

For each system, the resulting source terms for each radionuclide can be represented as the differences between the release by the "as-built" system and the releases by an alternate system. These differences are summarized in PARTS I and II of TABLE 6.4.1-2. In those systems augmented by additional equipment, the difference is positive, representing a reduction in release. When a piece of equipment is eliminated, the difference becomes positive and represents an increase in release.

6.4.2 Changes In Population Dose For Alternate Liquid Treatment Systems: Using 1980 population data, the changes in population dose resulting from these releases were computed using the LIP Code (1). These results are summarized in TABLE 6.4.2-1.

6.4.3 Annualized Costs of Alternate Systems: The resulting cost increases, or savings, for the alternate systems are given in TABLE 6.4.3-1. Data developed in PART II, SUPPLEMENT C, were used to compute these costs.

6.4.4 Cost-Benefit Ratios of Alternate Systems: The cost-benefit ratio for each system was determined by the

TABLE 6.4.1-1

ST. LUCIE PLANT, UNIT No. 1: GALE Input Terms For Alternate Liquid Treatment Systems

System Designation	Purpose	Card No.	Lines	Entry
		Card Changes Required		
G-1	Remove Cation Bed from Steam Generator Blowdown	28	21-28	1E+02
			34-41	1E+01
			47-54	1E+02
G-2	Remove Mixed Bed from Steam Generator Blowdown	28	21-28	1E 00
			34-41	1E+01
			47-54	1E+01
G-3	Discard Steam Generator Blow-down w/o Treatment	28	21-28	1E 00
			34-41	1E 00
			47-54	1E 00
			80	0
H-1[a]	Determine Effect of Clean Waste System	24	42-49	0
			21-28	1
			34-41	1
			47-54	1
H-2	Remove Evap. from Clean Waste System	24	42-49	0
		25	21-28	1
			34-41	1
			47-54	1
		22	21-28	1E+01
			34-41	2E 00
			47-54	1E+01
H-3	Remove Demin. from Clean Waste System	24	42-49	0
		25	21-28	1
			34-41	1
			47-54	1
		22	21-28	1E+03
			34-41	1E+04
			47-54	1E+04
H-4	Increase No. Collection Tanks Clean Waste System	24	42-49	0
		25	21-28	1
			34-41	1
			47-54	1
		23	28-33	21
			48-53	6.9
H-5	Increase No. Collection Tanks and Remove Evap. Clean Waste	24	42-49	0
		25	21-28	1
			34-41	1
			47-54	1
		22	21-28	1E+01
			34-41	2E 00
			47-54	1E+01
		23	28-33	21
			48-53	6.9

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TABLE 6.4.1-1 continued;

System Designation	Purpose	Card Changes Required Card No.	Lines	Entry
I	Add Reverse Osmosis to Detergent	45	73-80	0.033
J-1[a]	Determine Effect of Dirty Waste System	21	42-49	0
		22	21-28	1
			34-41	1
			47-54	1
J-2	Remove Evap. from Dirty Waste System	21	42-49	0
		22	21-28	1
			34-41	1
			47-54	1
		25	21-28	1E+01
			34-41	2E 00
			47-54	1E+01
J-3	Remove Demin. from Dirty Waste	21	42-49	0
		22	21-28	1
			34-41	1
			47-54	1
		25	21-28	1E+03
			34-41	1E+04
			47-54	1E+04
J-4	Increase No. Collection Tanks Dirty Waste	21	42-49	0
		22	21-28	1
			34-41	1
			47-54	1
		26	28-33	23
			48-53	3.5
J-5	Increase No. Collection Tanks and Remove Evap. Dirty Waste	21	42-49	0
		22	21-28	1
			34-41	1
			47-54	1
		25	21-28	1E+01
			34-41	2E 00
			47-54	1E+01
		26	28-33	23
			48-53	3.5

[a]These cases are not alternates but are required to separate the discharges from the Clean and Dirty Systems so as to provide Base Cases for the subsequent alternates to each system.

TABLE 6.4.1-2

ST. LUCIE PLANT, UNIT No. 1: Reductions In Liquid Releases Resulting From Alternate Treatment Systems[a]

(all values in curie/year)

PART I:

Isotope	G-1. Remove Cation Bed SG Blowdown	G-2. Remove Mixed Bed SG Blowdown	G-3. Discard SG Blowdown w/o Treatment	H-2. Remove Evap. Clean Waste Syst.	H-3. Remove Demin Clean Waste Syst.	H-4. Add a Collection Tank Clean Waste
H-3						
Na-24						
P-32						
Cr-51		-1.93E-03	-2.12E-02	-1.78E-02	-1.60E-05	1.30E-07
Mn-54		-4.68E-04	-5.15E-03	-4.00E-03	-3.60E-06	3.00E-09
Fe-55		-1.64E-03	-1.80E-02	-2.11E-02	-1.90E-05	
Fe-59		-1.19E-03	-1.31E-02	-1.07E-02	-9.63E-06	5.00E-08
Co-58		-1.66E-02	-1.82E-01	-1.86E-01	-1.67E-04	6.00E-07
Co-60		-2.11E-03	-2.32E-02	-2.66E-02	-2.39E-05	1.00E-08
Ni-63						
Cu-64						
Br-83		-5.92E-03	-5.92E-03	-1.18E-20	-1.06E-22	1.18E-23
Br-84		-9.88E-06	-9.88E-06			
Rb-86	-8.93E-05	-8.93E-05	-9.82E-04	-3.08E-03	-5.54E-07	6.80E-09
Rb-88						
Sr-89		-4.75E-04	-5.23E-03	-3.86E-03	-3.47E-06	1.60E-08
Sr-90		-1.30E-05	-1.30E-04	-1.33E-04		
Sr-91		-2.93E-04	-3.23E-03	-1.73E-08	-1.56E-11	1.60E-12
Y-90			-7.44E-05	-1.27E-04		
Y-91m		-1.96E-04	-2.16E-03	-1.12E-08	-1.01E-11	1.04E-12
Y-91		-7.23E-05	-7.95E-04	-7.62E-04	-6.86E-07	2.90E-09
Y-92						
Y-93		-2.15E-05	-2.15E-04			
Zr-95		-7.10E-05	-7.81E-04	-6.88E-04	-6.19E-07	2.40E-09
Zr-97						

PART I:
TABLE 6.4.1-2 continued:

Isotope	G-1. Remove Cation Bed SG Blowdown	G-2. Remove Mixed Bed SG Blowdown	G-3. Discard SG Blowdown w/o Treatment	H-2. Remove Evap. Clean Waste Syst.	H-3. Remove Demin Clean Waste Syst.	H-4. Add a Collection Tank Clean Waste
Nb-95m						
Nb-95		-7.22E-05	-7.94E-04	-6.78E-04	-6.10E-07	1.00E-10
Nb-97m						
Nb-97						
Mo-99		-9.09E-02	-9.99E-01	-6.14E-02	-5.53E-05	2.60E-06
Tc-99m		-1.87E-01	-2.06E 00	-5.86E-02	-5.27E-05	2.48E-06
Ru-103	+5.31E-06	-4.78E-05	-5.26E-04	-4.69E-04	-4.22E-07	2.70E-09
Ru-106		-1.30E-05	-1.30E-03	-1.30E-04		
Rh-103m		-5.89E-05	-6.48E-04	-4.69E-04	-4.22E-07	2.60E-09
Rh-105						
Rh-106		-1.30E-05	-130E-04	-1.30E-04		
Sn-117m						
Te-125m		-2.37E-05	-2.37E-04	-3.26E-04		
Te-127m		-2.12E-04	-2.33E-03	-3.41E-03	-3.07E-06	7.00E-09
Te-127		-1.04E-03	-1.15E-02	-3.37E-03	-3.03E-06	7.00E-09
Te-129m		-1.44E-03	-1.58E-02	-1.40E-02	-1.26E-05	9.00E-08
Te-129		-1.51E-03	-1.66E-02	-8.97E-03	-8.97E-03	5.70E-08
Te-131m		-1.83E-03	-2.01E-02	-1.44E-04	-1.30E-07	9.05E-09
Te-131		-3138E-04	-3.72E-03	-2.62E-05	-2.36E-08	1.64E-08
Te-132		-2.35E-02	-2.58E-01	-2.78E-02	-2.50E-05	1.09E-06
I-130		-1.28E-02	-1.28E-02	-5.94E-07	-5.36E-09	5.21E-10
I-131		-3.17E 00	-3.17E 00	-1.15E 00	-1.04E-02	2.51E-04
I-132		-4.34E-01	-6.17E-01	-2.86E-02	-2.57E-05	1.11E-06
I-133		-2.90E 00	-2.90E 00	-3.99E-03	-3.59E-05	2.93E-06
I-134		-3.03E-03	-3.03E-03			
I-135		-7.86E-01	-7.86E-01	-5.09E-08	-4.58E-10	4.96E-11
Cs-134	-2.57E-02	-2.57E-02	-2.82E-01	-1.51E 00	-2.71E-04	1.00E-07
Cs-136	-1.13E-02	-1.13E-02	-1.25E-01	-3.79E-01	-6.82E-05	1.14E-06
Cs-137	-1.71E-02	-1.71E-02	-1.88E-01	-1.10E 00	-1.98E-04	1.00E-07

PART I:
TABLE 6.4.1-2 continued:

Isotope	G-1. Remove Cation Bed SG Blowdown	G-2. Remove Mixed Bed SG Blowdown	G-3. Discard SG Blowdown w/o Treatment	H-2. Remove Evap. Clean Waste Syste.	H-3. Remove Demin Clean Waste Syst.	H-4. Add a Collection Tank Clean Waste
Ba-137m	-1.59E-02	-1.59E-02	-1.75E-01	-2.05E-01	-1.85E-04	
Ba-140		-2.25E-04	-2.48E-03	-1.39E-03	-1.25E-06	2.10E-08
La-140		-2.89E-04	-3.18E-03	-1.60E-03	-1.44E-06	2.40E-08
Ce-141		-7.21E-05	-7.93E-04	-6.90E-04	-6.21E-07	4.60E-09
Ce-143		-3.57E-05	-3.57E-04			
Ce-144	+5.20E-06	-4.68E-05	-5.15E-04	-4.25E-04	-3.83E-07	3.00E-10
Pr-143	+5.57E-06	-5.01E-05	-5.51E-04	-3.60E-04	-3.24E-07	5.20E-09
Pr-144	+5.21E-06	-4.69E-05	-5.16E-04	-4.25E-04	-3.83E-07	3.00E-10
Nd-147						
W-185						
W-187						
U-237						
Np-239		-9.36E-04	-1.03E-02	-5.68E-04	-5.11E-07	2.62E-08
Others						
Total	-7.01E-02	-7.72E 00	1.19E+01	-5.66E 00	1.15E-02	2.65E-04

[a] Positive values are reductions in releases; negative values are increases in releases.

TABLE 6.4.1-2

ST. LUCIE PLANT, UNIT No. 1: Reductions In Liquid Releases Resulting From Alternate Treatment Systems[a]

(all values in curie/year)

PART II:

Isotope	H-5. Add Tank Remove Evap. Clean Waste	I. Add Reverse Osmosis Detergent	J-2. Remove Evap. Dirty Waste Syst.	J-3. Remove Demin Dirty Waste Syst.	J-4. Add a Collection Tank Dirty Waste	J-5. Add Tank Remove Evap. Dirty Waste
H-3						
Na-24						
P-32						
Cr-51	-1.65E-02		-1.32E-02	-1.19E-05	3.84E-07	-9.36E-03
Mn-54	-3.97E-03	9.67E-04	-2.21E-03	-1.99E-06	7.00E-09	-2.14E-03
Fe-55	-2.11E-02		-1.14E-02	-1.03E-05	1.00E-08	-1.13E-02
Fe-59	-1.02E-02		-7.03E-03	-6.33E-06	1.37E-07	-5.66E-03
Co-58	-1.80E-01	3.87E-03	-1.13E-01	-1.02E-04	1.45E-06	-2.98E-02
Co-60	-2.65E-02	8.41E-03	-1.43E-02	-1.29E-05	1.00E-08	-1.42E-02
Ni-63						
Cu-64						
Br-83	-1.12E-23		-1.83E-03	-1.65E-05	1.83E-06	-1.83E-06
Br-84			-1.79E-05			
Rb-86	-2.74E-03		-2.62E-03	-4.80E-07	2.11E-08	-1.61E-03
Rb-88			-3.24E-04			
Sr-89	-3.70E-03		-2.47E-03	-2.22E-06	4.30E-08	-2.04E-03
Sr-90	-1.33E-04		-7.14E-05			-7.13E-05
Sr-91	-1.26E-09		-1.49E-03	-1.34E-06	1.49E-07	-6.50E-08
Y-90	-1.30E-04		-1.62E-05			-6.70E-05
Y-91m	-8.14E-10		-9.62E-04	-8.66E-07	9.62E-08	-4.18E-03
Y-91	-7.33E-04		-4.66E-04	-4.19E-07	6.30E-09	-4.03E-04
Y-92						
Y-93			-8.17E-05			
Zr-95	-6.64E-04		-4.24E-04	-3.82E-07	6.00E-09	-3.64E-04
Zr-97						

PART II:
TABLE 6.4.1-2 continued:

Isotope	H-5. Add Tank Remove Evap. Clean Waste	I. Add Reverse Osmosis Detergent	J-2. Remove Evap. Dirty Waste Syst.	J-3. Remove Demin Dirty Waste Syst.	J-4. Add a Collection Tank Dirty Waste	J-5. Add Tank Remove Evap. Dirty Waste
Nb-95m						
Nb-95	-6.77E-04		-3.55E-04	-3.20E-07	7.00E-10	-3.62E-04
Nb-97m						
Nb-97						
Mo-99	-3.54E-02		-4.81E-01	-4.33E-04	4.41E-05	-4.03E-02
Tc-99m	-3.38E-02		-3.81E-01	-3.43E-04	3.43E-05	-3.85E-02
Ru-103	-4.42E-04	1.35E-04	-3.16E-04	-2.84E-07	6.90E-09	-2.47E-04
Ru-106	-1.29E-04		-7.12E-05			-6.93E-05
Rh-103m	-4.43E-04		-3.18E-04	-2.86E-07	7.10E-09	-2.47E-04
Rh-105						
Rh-106	-1.29E-04		-7.12E-05			-6.93E-05
Sn-117m						
Te-125m	-3.14E-04		-2.05E-04			-1.73E-04
Te-127m	-3.34E-03		-1.99E-03	-1.79E-06	1.80E-08	-1.81E-03
Te-127	-3.30E-03		-3.04E-03	-2.74E-06	1.25E-07	-1.79E-03
Te-129m	-1.31E-02		-9.80E-03	-8.82E-06	2.44E-07	-7.36E-03
Te-129	-8.40E-03		-6.41E-03	-5.77E-06	1.69E-07	-4.72E-03
Te-131m	-5.35E-05		-1.14E-02	-1.03E-02	1.12E-06	-1.71E-04
Te-131	-9.76E-06		-2.08E-03	-1.87E-06	2.05E-07	-3.12E-05
Te-132	-1.69E-02		-1.59E-01	-1.43E-04	1.42E-05	-1.71E-02
I-130	-7.31E-08		-5.89E-03	-5.31E-05	5.90E-06	-2.46E-06
I-131	-8.98E-01	5.99E-05	-1.79E 00	-1.61E-02	1.18E-03	-6.04E-01
I-132	-1.75E-02		-1.86E-01	-9.99E-04	1.09E-04	-1.76E-02
I-133	-1.07E-03		-1.48E 00	-1.33E-02	1.47E-03	-6.21E-03
I-134			-1.89E-03	-1.71E-05	1.90E-06	-1.90E-06
I-135	-1.23E-09		-3.05E-01	-2.75E-03	3.05E-04	-3.02E-04
Cs-134	-1.26E 00	1.26E-02	-8.15E-01	-1.47E-04	2.00E-07	-8.05E-01
Cs-136	-3.22E-01		-4.01E-01	-7.22E-05	4.07E-06	-1.97E-01
Cs-137	-1.10E 00	2.32E-02	-5.85E-01	-1.05E-04		-5.85E-01

PART II:
TABLE 6.4.1-2 continued:

Isotope	H-5. Add Tank Remove Evap. Clean Waste	I. Add Reverse Osmosis Detergent	J-2. Remove Evap. Dirty Waste Syst.	J-3. Remove Demin Dirty Waste Syst.	J-4. Add a Collection Tank Dirty Waste	J-5. Add Tank Remove Evap. Dirty Waste
Ba-137m	-1.03E 00		-5.50E-01	-9.90E-05		-5.50E-01
Ba-140	-1.18E-03		-1.49E-03	-1.34E-06	7.63E-08	-7.27E-04
La-140	-1.36E-03		-1.06E-03	-9.54E-07	2.32E-08	-8.28E-04
Ce-141	-6.44E-04		-4.89E-04	-4.40E-07	1.26E-08	-3.63E-04
Ce-143			-1.89E-04			
Ce-144	-4.22E-04	5.03E-03	-2.35E-04	-2.12E-07	8.00E-10	-2.27E-04
Pr-143	-3.08E-04		-3.46E-04	-3.11E-07	1.59E-08	-1.87E-04
Pr-144	-4.22E-04		-2.35E-04	-2.12E-07	8.00E-10	-2.27E-04
Nd-147						
W-185						
W-187						
U-237						
Np-239	-3.06E-08		-6.62E-03	-5.96E-06	6.21E-07	-4.06E-04
Others						
Total	-5.25E 00	5.42E-02	-7.35E 00	3.48E-02	3.18E-03	-2.58E 00

[a]Positive values are reductions in releases; negative values are increases in releases.

TABLE 6.4.2-1

ST. LUCIE PLANT, UNIT No. 1: Changes In Population Doses Resulting From Use of Alternate Liquid Treatment Systems

A. SYSTEM G-1: REMOVE CATION BED FROM STEAM GENERATOR BLOWDOWN TREATMENT

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	0.	-8.44E-03	-8.44E-03
SALT WATER SHELLFISH	0.	-2.84E-04	-2.84E-04
OCEAN SHORELINE DEPOSITS	-3.92E-04	-3.92E-04	-7.84E-04
SWIMMING	-8.86E-04	-8.86E-07	-1.77E-06
BOATING	-1.77E-07	-1.77E-07	-3.55E-07
TOTAL	-3.80E-04	-9.10E-03	-9.48E-03

B. SYSTEM G-2: REMOVE MIXED BED FROM STEAM GENERATOR BLOWDOWN TREATMENT

SALT WATER FISH	-1.53E+00	-1.40E-02	-1.55E+00
SALT WATER SHELLFISH	-4.18E-01	-4.33E-03	-4.22E-01
OCEAN SHORELINE DEPOSITS	-5.22E-04	-5.22E-04	-1.04E-03
SWIMMING	-6.27E-05	-6.27E-05	-1.25E-04
BOATING	-1.26E-05	-1.26E-05	-2.51E-05
TOTAL	-1.95E+00	-1.80E-02	-1.97E+00

C. SYSTEM G-3: DISCARD STEAM GENERATOR BLOWDOWN WITHOUT TREATMENT

SALT WATER FISH	-1.54E+00	-1.25E-01	-1.66E+00
SALT WATER SHELLFISH	-4.53E-01	-3.97E-02	-4.93E-01
OCEAN SHORELINE DEPOSITS	-5.04E-03	-5.04E-03	-1.01E-02
SWIMMING	-8.50E-05	-8.50E-05	-1.70E-04
BOATING	-1.70E-05	-1.70E-05	-3.40E-05
TOTAL	-1.98E+00	-1.60E-01	-2.14E+00

D. SYSTEM H-2: REMOVE EVAPORATOR FROM CLEAN WASTE SYSTEM

SALT WATER FISH	-5.56E-01	-1.33E-01	-6.89E-01
SALT WATER SHELLFISH	-1.70E-01	-2.53E-02	-1.95E-01
OCEAN SHORELINE DEPOSITS	-5.55E-03	-5.55E-03	-1.11E-02
SWIMMING	-1.83E-05	-1.83E-05	-3.67E-05
BOATING	-3.67E-06	-3.67E-06	-7.34E-06
TOTAL	-7.20E-01	-1.50E-01	-8.70E-01

TABLE 6.4.2-1 continued:

E. SYSTEM H-3: REMOVE EVAPORATOR FROM CLEAN WASTE SYSTEM

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	-5.01E-03	-1.28E-04	-5.13E-03
SALT WATER SHELLFISH	-1.37E-03	-2.51E-05	-1.40E-03
OCEAN SHORELINE DEPOSITS	-5.17E-06	-5.17E-06	-1.03E-05
SWIMMING	-5.74E-08	-5.74E-08	-1.15E-07
BOATING	-1.15E-08	-1.15E-08	-2.30E-08
TOTAL	-6.37E-03	-1.50E-04	-6.52E-03

F. SYSTEM H-4: INCREASE NUMBER OF EQUIPMENT DRAIN TANKS (CLEAN WASTE)

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	1.21E-04	3.24E-07	1.22E-04
SALT WATER SHELLFISH	3.30E-05	1.94E-07	3.32E-05
OCEAN SHORELINE DEPOSITS	7.43E-09	7.43E-09	1.49E-08
SWIMMING	1.20E-09	1.20E-09	2.40E-09
BOATING	2.40E-10	2.40E-10	4.80E-10
TOTAL	1.50E-04	0.	1.50E-04

G. SYSTEM H-5: ADD COLLECTION TANKS AND REMOVE EVAPORATOR FROM CLEAN WASTE

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	-4.34E-01	-1.32E-01	-5.66E-01
SALT WATER SHELLFISH	-1.35E-01	-2.40E-02	-1.59E-01
OCEAN SHORELINE DEPOSITS	-5.51E-03	-5.51E-03	-1.10E-02
SWIMMING	-1.64E-05	-1.64E-05	-3.27E-05
BOATING	-3.28E-06	-3.28E-06	-6.56E-06
TOTAL	-5.70E-01	-1.50E-01	-7.20E-01

H. SYSTEM I: ADD REVERSE OSMOSIS TO DETERGENT WASTES

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	2.90E-05	6.32E-03	6.35E-03
SALT WATER SHELLFISH	7.84E-06	3.55E-04	3.63E-04
OCEAN SHORELINE DEPOSITS	5.60E-04	5.60E-04	1.12E-03
SWIMMING	6.86E-07	6.86E-07	1.37E-06
BOATING	1.37E-07	1.37E-07	2.75E-07
TOTAL	6.00E-04	7.20E-03	7.80E-03

I. SYSTEM J-2: REMOVE EVAPORATOR FROM DIRTY WASTE SYSTEM

PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
SALT WATER FISH	-8.67E-01	-7.44E-02	-9.41E-01
SALT WATER SHELLFISH	-2.58E-01	-2.44E-02	-2.82E-01
OCEAN SHORELINE DEPOSITS	-3.03E-03	-3.03E-03	-6.05E-03
SWIMMING	-3.86E-05	-3.86E-05	-7.73E-05
BOATING	-7.73E-06	-7.73E-06	-1.55E-05
TOTAL	-1.12E+00	-9.00E-02	-1.21E+00

TABLE 6.4.2-1 continued:

SYSTEM J-3: REMOVE DEMINERALIZER FROM DIRTY WASTE SYSTEM

	PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
J.	SALT WATER FISH	-7.80E-03	-8.02E-05	-7.88E-03
	SALT WATER SHELLFISH	-2.13E-03	-2.56E-05	-2.15E-03
	OCEAN SHORELINE DEPOSITS	-3.04E-06	-3.04E-06	-6.08E-06
	SWIMMING	-2.49E-07	-2.49E-07	-4.99E-07
	BOATING	-4.99E-08	-4.99E-08	-9.99E-08
	TOTAL	-9.92E-03	-1.00E-04	-1.00E-02

K. SYSTEM J-4: INCREASE THE NUMBER OF DIRTY WASTE COLLECTION TANKS

	PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
	SALT WATER FISH	5.73E-04	1.32E-06	5.74E-04
	SALT WATER SHELLFISH	1.56E-04	1.35E-06	1.58E-04
	OCEAN SHORELINE DEPOSITS	3.16E-08	3.16E-08	6.32E-08
	SWIMMING	2.43E-08	2.43E-08	4.86E-08
	BOATING	4.87E-09	4.87E-09	9.73E-09
	TOTAL	7.30E-04	0.	7.30E-04

L. SYSTEM J-5: ADD COLLECTION TANKS AND REMOVE EVAPORATOR FROM DIRTY WASTE

	PATHWAY	THYROID MTR/YEAR	TOTAL BODY MAN-REM/YR	TOTAL MAN-REM/YR
	SALT WATER FISH	-2.92E-01	-7.09E-02	-3.63E-01
	SALT WATER SHELLFISH	-8.95E-02	-1.36E-02	-1.03E-01
	OCEAN SHORELINE DEPOSITS	-2.96E-03	-2.96E-03	-5.91E-03
	SWIMMING	-9.83E-06	-9.83E-06	-1.97E-05
	BOATING	-1.97E-06	-1.97E-06	-3.93E-06
	TOTAL	-3.84E-01	-8.60E-02	-4.70E-01

TABLE 6.4.3-1

ST. LUCIE PLANT, UNIT No. 1: Annualized Costs of Alternate Liquid Systems

System Designation	Description of Change	ΔCost $/year[a]
	Steam Generator Blowdown Treatment	
G-1	Remove Cation Bed	(151,300)[b]
G-2	Remove Mixed Bed	(246,500)
G-3	Discard Blowdown w/o Treatment	(398,000)
	Clean Waste System	
H-2	Remove Evaporator	(245,000)
H-3	Remove Demineralizer	(21,900)
H-4	Increase Tankage	35,500
H-5	Remove Evap. & Increase Tankage	(209,700)
	Dirty Waste System	
J-2	Remove Evaporator	(215,700)
J-3	Remove Demineralizer	(19,200)
J-4	Increase Tankage	58,800
J-5	Remove Evap. & Increase Tankage	(156,900)
I	Add Reverse Osmosis to Detergent	55,700
	Combinations	
H-2, J-2	Remove Evaporator[c]	(275,000)
H-3, J-3	Remove Demineralizer[c]	(23,900)

[a] See PART II, ATTACHMENT C, for details of cost estimating.

[b] All values in ( )'s represent cost savings.

[c] The clean and dirty waste systems use the same equipment; therefore, if equipment augment is removed, it must be removed from both systems.

methodology described in Section 6.2 and Paragraph 6.3.4 above. Based on 1980 population data, these values are summarized in TABLE 6.4.4-1.

6.5 CONCLUSIONS

The cost-benefit ratios listed in TABLES 6.3.4-1 and 6.4.4-1 for alternate gaseous and liquid treatment systems definitely show that the "as-built" systems at ST. LUCIE PLANT, UNIT No. 1 are in compliance with Paragraph II D of APPENDIX I. No additional benefits would be gained by the use of any of the alternative systems evaluated. Such ratios are indicative that the "as-built" systems of UNIT No. 1 are overequipped, in fact, waste management at UNIT No. 1 could be effectively accomplished in the manner outlined in TABLE 6.5-1.

Although cost-beneficiality is a necessary condition of the Staff requirements for the selection of waste treatment equipment, the lack of cost-beneficiality is not a sufficient condition for the removal of equipment. However, if in any instance, non-beneficial components were removed from a system, the resulting population doses would still meet the requirements of Paragraphs II A, B, and C of APPENDIX I. On this basis, ST. LUCIE PLANT, UNIT No. 1's gaseous and liquid treatment systems could adequately satisfy APPENDIX I re-

TABLE 6.4.4-1

ST. LUCIE PLANT, UNIT No. 1: Cost-Benefit Ratios For Use Of Alternate Liquid Systems

System Designation	Purpose	Annual ΔDose man-rem[a]	Annual ΔCost dollars[b]	Cost-Benefit Ratios: $ Cost/ man-rem saved	Cost-Benefit Ratios: $ Saved/ man-rem increase
	Steam Generator Blowdown Treatment[c]				
G-1	Remove Cation Bed	(1.90E-02)[d]	(151,300)[e]		8.0E+06
G-2	Remove Mixed Bed	(3.94E 00)	(246,500)		6.3E+04
G-3	Discard Blowdown w/o Treatment	(4.32E 00)	(398,000)		9.2E+04
	Clean Waste System				
H-2	Remove Evaporator	(1.35E 00)	(245,000)		1.8E+05
H-3	Remove Demineralizer	(6.54E-03)	(21,900)		3.4E+06
H-4	Increase Tankage	1.55E-04	35,000	2.3E+08	
H-5	Remove Evap. & Increase Tankage	(1.18E 00)	(209,700)		1.8E+05
	Dirty Waste System				
J-2	Remove Evaporator	(1.48E 00)	(215,700)		1.5E+05
J-3	Remove Demineralizer	(1.00E-02)	(19,200)		1.9E+05
J-4	Increase Tankage	7.32E-04	58,800	8.0E+07	
J-5	Remove Evap. & Increase Tankage	(7.13E-01)	(156,900)		2.2E+05
I	Add Reverse Osmosis to Detergent	7.84E-03	55,700	7.1E+06	
	Combinations				
H-2, J-2	Remove Evaporator[f]	(2.83E 00)	(275,000)		9.7E+04
H-3, J-3	Remove Demineralizer[f]	(1.65E-02)	(23,900)		1.5E+06

[a]From TABLE 6.4.2-1

[b]From TABLE 6.4.3-1

TABLE 6.4.4-1 continued:

[c] The Steam Generator Blowdown System will serve both Units 1 and 2, therefore, the dose values from TABLE 6.4.2-1.

[d] Values in ( ) in this column are increases.

[e] Values in ( ) in this column are cost savings.

[f] Since the evaporator and demineralizer serve both clean and dirty waste, they cannot be removed from one system only. These data show the effect on both the clean and dirty waste systems.

TABLE 6.5-1

ST. LUCIE PLANT, UNIT No. 1: An Effective Waste Management System

A. THE GASEOUS WASTE SYSTEM

Component	Treatment
Gas Decay	As installed
Auxiliary Bldg.	Remove HEPA, discard w/o treatment
Containment	Remove kidney & HEPA on high volume purge
Condenser Air Ejector	Discharge w/o treatment
Turbine Bldg.	No treatment

B. THE LIQUID TREATMENT SYSTEM

Component	Treatment
Shim Bleed & Equipment Drains	Holdup Tanks[a] Ion Exchange[a] Evaporator[a] Condensate Polisher[a]
Clean Waste	Discard after Filtration
Dirty Waste	Discard after Filtration
Steam Generator Blowdown	Discard after Filtration
Turbine Bldg. Sumps	Discard without Treatment
Detergent Waste	Discard after Filtration

[a]This equipment is required for reactor operation and cannot be removed from system.

quirements if the effluent releases of each of their components were treated in the manner emphasized in TABLE 6.5-1.

6.6 REFERENCES

1. Constructed by NUCLEAR SAFETY ASSOCIATES, Bethesda, Maryland.

SUPPLEMENT A

ST. LUCIE PLANT, UNIT No. 1:

Data For Source Term Calculations

ABSTRACT

ST. LUCIE PLANT UNIT No. 1 is a pressurized water reactor. The guidelines of APPENDIX D to Regulatory Guide 1.BB have been used to present the data required for source term calculations. These are summarized in the following TABLE I.

TABLE I

ST. LUCIE PLANT, UNIT No. 1: Data For Source Term Calculations

ITEM:	Data and/or Information Required	Numerical values	References, Remarks
1.	a. Plant capacity factor	80%	Reg. Guide 1.112
	b. Fraction of Fuel Releasing Radioactivity	1%	FSAR Vol. 9 TABLE 11.1-2
	1. Type fuel cladding	Zircaloy-4	FSAR Vol. 5, TABLE 4.2-2
	c. Fission product escape rate coefficient		See ATTACHMENT A
	d. Corrosion product release rate coefficients		See ATTACHMENT A
	e. Trituim release rate		FSAR Vol. 9, TABLE 11.2-14A
	1. Liquid	339 Ci/yr	
	2. Gaseous	4 . .	
2.	Maximum core thermal power	2700 Mwt	FSAR Vol. 1, p. 1.1-1
3.	Total mass of coolant in Primary System (excluding pressurizer and primary coolant purification system)	473,124 lbs	FSAR Vol. 5, pp. 5.1-3,-5 and calculations using 1967 ASME STEAM TABLES
4.	a. Total uranium metal in equilibrium core	82,850 kg	FSAR Vol. 5, TABLE 4.2-1

TABLE I - Cont'd: .Page 2

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks
4.	b. Total mass of Pu in equilibrium core	986 lbs	Calculated From FSAR Vol. 5, TABLE 4.3-1
5.	Percent Pu-238 enrichment in equilibrium core	0	All Pu results from U-238 capture
6.	Percent enrichment of U in equilibrium core	2.35%	From FSAR Vol. 5, TABLE 4.2-1
7.	Average Primary System letdown rate to the primary purification system	4 gpm	FSAR Vol. 9, p. 11.1-12
8.	Average flow rate through primary coolant purification system cation demineralizers	8 gpm	FSAR Vol. 9, TABLE 11.1-2
9.	Number and type of steam generators	2	Vertical U-tube from FSAR Vol. 5, TABLE 5.5-1
	a. Carryover factor for iodine and nonvolatiles	5%	Reg. Guide 1.42, APPENDIX A, "Partition and Decontamination Factors"
10.	Total system flow in Secondary System	1.17×10^7 lbs/hr	FSAR Vol. 10, FIGURE 10.1-5
11.	Mass of steam in each SG	9,500 lbs	FSAR Vol. 11, TABLE 11.2-13 and calculations using 1967 ASME Steam Tables

TABLE I - Cont'd: Page 3

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
12.	Mass of liquid in each SG	136,500 lbs	Same as No. 11
13.	Total mass of coolant in Secondary System	592,800 lbs	By calculation from data in TABLE 11.2-13; coolant volume = 9662 ft^3
14.	Average SG blowdown rate	224 gpm	By calculation from FSAR Vol. 5, TABLE 5.5-1
15.	Regeneration frequency for condensate demineralizer	0	
16.	a. Fraction of SG feedwater processed through condensate demineralizer	0	
	b. DF's used in evaluation of the condensate demineralizer	0	
17.	Flow rate of water used to dilute waste prior to discharge	5.13×10^5	From FSAR Vol. 11, p. 11.2-31
18.	Average RCS letdown (shim bleed)	50-60 gpm	FSAR Vol.9, TABLE 11.2-3
19.	Description of process system and flow diagrams		See ATTACHMENT B
20.	a. Collection, processing and discharge holdup times		Continuous; Direct to VCT or diversion (when required) to CVCS with return to primary system

TABLE I - Cont'd: Page 4

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
20.	b. Fraction of processed stream expected to be discharged over life of the plant	0	Continuous process, with no discharge
	c. Capacities of tanks in RCS let-down system		See Part 2.3 ATTACHMENT B
21.	Sources, flow rates, activities of any other wastes processed with RCS letdown system	a) Reactor Coolant Leakage 200 gpd b) Resin dewatering, 3,800 gpy	FSAR Vol. 9, TABLE 11.2-1
22.	Description of system used to process materials identified in ITEM 21		ATTACHMENT B
23.	Holdup times, fraction discharged and tank capacities of waste materials identified in ITEM 21		Described in Part 2,3, ATTACHMENT B
24.	Clean Waste System:		For this statement, the Equipment Drain Tank is considered to be only clean waste source
	a. Average Flow Rate	0.052 gpm	FSAR Vol. 9, TABLE 11.2-1
	b. Activities in system	nil	Activity virtually nondetectable; less than 10^{-7} microcuries/cc
25.	Description of system used to process clean wastes		See ATTACHMENT B

TABLE I - Cont'd: Page 5

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
25.	a. DF's used in evaluation		Assumed $>10^6$
26.	Clean Waste System:		
	a. Holdup times	4.5 days	Normal operations
	b. Fraction of stream discharged over plant life	0	
	c. Capacity of Equipment Drain tanks	1,000 gals	
27.	Dirty Waste System: Input sources, average flow rates, activities of wastes processed		See ATTACHMENT B, Part 2.0
28.	a. Holdup times of dirty waste system		Continuous processing; no planned holdup times
	b. Fraction of the processed stream discharged	100%	
	c. Tank capacities		See Part 2.3 of ATTACHMENT B
29.	Description of and flow diagrams of dirty waste system		See Part 2.0 of ATTACHMENT B
30.	Description of system used to maintain secondary coolant purity		See ATTACHMENT C
	a. Primary-secondary system leakage rate	6 gph	FSAR Vol. 5, P. 5.2-27

TABLE . I .- Cont'd: Page 6

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
30.	b. Steam generator blowdown rate	50 gpm	
	c. Condensate demineralizer	2	Cation and mixed-bed demineralizers in series
31.	Description and flow diagrams of system used to process secondary wastes		See ATTACHMENT B
	a. DF's used in evaluation		Not applicable
32.	Hold up times, faction discharged and tank capacities of Secondary System		See Part 2.3, ATTACHMENT B
33.	Description of process for stripping FP gases from Primary Coolant		See ATTACHMENT B, Part 1
	a. Average stripping rate	0,097 scfm	Continuous; from FSAR Vol.9, P. 11.2-6w
	b. Number of Primary Coolant volumes stripped annually	4	For cold reactor shutdown
	c. Reactor operation mode		Base-load

TABLE I _ Cont'd: . Page 7

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
34.	Process used to holdup gases		See ATTACHMENT B, Part 1.0
	a. Component Specifications		
	1. Tank capacities	144 ft^3, each	
	2. Number	3	
	3. Storage pressures	190 psi	
35.	Volumes of gas stripped from primary coolant	50,700 scf/yr	From FSAR
36.	Normal Operation of Waste Gas Processing system		
	a. Number of tanks held in reserve for shutdown	2	
	b. Fill-time for tanks	variable	Dependent on letdown rate and rate of process of water letdown
	c. Minimum holdup time to fill tank	Variable, dependent on operation; can be from 1 to 37.8 days. Assumed 3-day fill time.	
37.	a. Primary Coolant leak rate to Auxiliary Building	10 gal/day	FSAR Vol. 9, TABLE 11.2-13
	b. Iodine partition factor	0.003	FSAR Vol. 9, TABLE 11.2-13
	c. Temperature of PC letdown line	300 °F	

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks, etc.
38.	Treatment provided for Auxiliary Building ventilation air to reduce iodine prior to discharge and DF for charcoal adsorber		No iodine treatment system on units
39.	Total free volume of Containment Building	2.5×10^6	From FSAR
40.	Description of system to reduce airborne radioactivity from containment building atmosphere, etc.		No continuous system; emergency system available
41.	a. Number of containment purges per year		
	b. Bed depth and I DF of charcoal adsorber		
	c. PC leak rate to Containment Building		
42.	System for reduction of steam leakage to Turbine Building		No Turbine Building
43.	Description of treatment system to reduce gaseous iodine release from Steam Generator Blowdown Flash Tank		No treatment system on units
44.	Description of treatment system to reduce iodine releases from the condenser air ejectors; fraction of iodine released		No treatment system on units

TABLE I - Cont'd: Page 9

ITEM:	Data and/or Information Required	Numerical Values	References, Remarks. etc.
45.	Solid Waste System description - inputs, volumes, curie contents and sources; principal radionuclides, time of onsite storage prior to shipment, etc.		See Part 3 of ATTACHMENT B
46.	Process and instrumentation diagrams for liquid, gaseous and solid rad-waste systems		FIGURES of these systems are part of respective ATTACHMENT B above
47.	Description of detergent wastes system treatment process		See ATTACHMENT B
	a. Sources		Laundry, decontamination and hot shower drains
	b. Flow Rate	Normal: 200 gpd	Estimated
		Peak (refueling): 4,000 gpd	Estimated
	c. Activities		FP's and Activation Products
	d. Tank capacities		See Part 2.3 of ATTACHMENT B
	e. DF's used in evaluation		$>10^6$

ATTACHMENT A

ST. LUCIE PLANT, UNIT No. 1

1. Fission Product Escape Rate Coefficients[a]

Noble Gases, sec^{-1}	6.5×10^{-8}
Br, I and Cs isotopes, sec^{-1}	$2.3 \times 1p^{-8}$
Te isotopes, sec^{-1}	1.4×10^{-9}
Mo isotopes, sec^{-1}	1.4×10^{-9}
Sr and Ba isotopes, sec^{-1}	1.4×10^{-11}
Y, La, Ce and Pr isotopes, sec^{-1}	1.4×10^{-11}

2. Corrosion Products Released To Primary Coolant[b]

Element	Release Rate Coefficient ($days^{-1}$)
Fe	8.3×10^{-2}
Cr	3.3×10^{0}
Ni, Mn, Ti, Co, Zn, W, V	1.3×10^{-2}
Mo	4.3×10^{-5}

(a) From FSAR Vol. 9, TABLE 11.1-2

(b) From RG 1.112, p. B-19

ATTACHMENT B

ST. LUCIE PLANT, UNIT No. 1 Radioactive Management

1.0 Gaseous Wastes - Sources To and Description of "As-Built" System

1.1 Sources: Plant gaseous releases come from these sources:

Reactor Auxiliary Building Ventilation
Turbine System Leakage
Steam Jet Air Ejector Operation
Gland System Condenser
Contaminent Purging
The Gas Collection Header
The Gas Surge Header

1.2 General Description:

The gaseous radwaste system used at ST. LUCIE PLANT, UNIT No. 1 processes the vent gases from equipment located in the chemical and volume control system, waste management system and fuel pool system, such that the radioactive gaseous release to the environs will be as low as practicable. The principal flow paths of the waste gas system are shown in the attached FIGURES.

Plant gaseous releases come from the reactor auxilliary building ventilation, turbine system leakage, steam jet air ejector operation, gland steam condenser operation and containment purging in addition to releases from the gas collection header and gas surge header. Gland steam has the same activity as turbine steam. Releases from the reactor auxiliary building ventilation system are based on leakage of unprocessed reactor coolant at 120°F. Containment purging results in a constant release regardless of percent failed fuel since the airborne radioactivity removal system is operated for as long as necessary to achieve the required activity levels.

The waste gas system is designed on a batch mode basis for flexibility of operation. These batching operations proceed intermittently at faster flow rates than the annual average process rates

and therefore the system components are sized accordingly. The waste gases are collected from the various source components by three headers: containment vent header, gas surge header, and gas collection header. The functions of the headers and their auxilliary equipment can be described in this manner:

a. The Containment Vent Header: Receives hydrogenerated potentially radioactive gas mixtures vented from the reactor drain tank, quench tank, refueling failed fuel detector vent, and reactor vessel head vent within the containment and directs the gases to the gas surge header.

b. The Gas Surge Header: In addition to the gases it receives from the containment vent header, the gas surge header receives hydrogenated and potentially radioactive gases vented from the volume control tank, flash tank, and boric acid concentrations in the reactor auxiliary building. The vented gases flow to a surge tank where they are collected prior to being compressed. Pressure instrumentation located on the surge tank controls tank volume; a level switch with a local alarm indicates to the operator when the tank should be emptied.

The pressure instrumentation on the surge tank also controls the compressors used to transfer the gas to the gas decay tanks. The gases flow from the gas surge tank to a compressor where they are compressed to 165 psig and cooled by an aftercooler prior to entering a gas decay tank where the gases are held up for radioactive decay.

There are three gas decay tanks, each of which are provided with local alarms and pressure and temperature indicators. The decay tanks have sufficient storage capacity (144 ft^3 each) for an average 30-day holdup. After the gaseous radioactivities have decayed to an acceptable level, consistent with the design objectives and verification by laboratory analysis, the gas is released to the environment via the plant vent at a controlled rate.

The system flow paths and release points of the gases from the gas decay tanks (and gas collection header) are indicated on FIGURE 3.1-1. The only flow bypass line in the water gas system is also shown in this sketch. This flow path permits the flow of gases directly from the surge tank to the vent pipe by bypassing the waste gas compressor and gas decay tanks. This path is used when the air or nitrogen is purged from process equipment after initial plant startup or for maintenance operations. During these periods, essentially no activity will be present in the gas

streams and it is unnecessary to route these gases to the gas decay tanks.

c. The Gas Collection Header: Collects the gases primarily from aerated vents of process equipment in the waste management system, chemical and volume control system, and fuel pool system. A listing of these sources are given in TABLE 2.1-1. Because of the large volume of gas and the low activity level from the sources, the gases are routed directly to the vent pipe, which contains radioactivity monitors with alarms to indicate unexpected activity releases.

The hydrogen and nitrogen gas required for plant operations are also part of this system and redundant supply headers for each gas are provided. Hydrogen gas is supplied to the volume control tank space to maintain the desired concentration of reactor coolant dissolved hydrogen to suppress the net decomposition of water in the reactor. Nitrogen cover and/or purge gas is provided to the holdup tanks, quench tank, reactor drain tank, safety injection tanks, spent resin tank, and gas surge tank. Nitrogen is also supplied to the flash tank for degassing liquid waste or for periodic purges of the various waste management system and chemical and volume control system.

1.3 System Components:

The principal components of the system are a gas compressor, aftercooler, filter, gas surge tank and gas decay tanks. There is 1 gas surge tank with a volume of 9 ft^3. There are 3 gas decay tanks with a volume of 144 ft^3 each. Holdup time of 37.8 days is assumed.

2.0 Liquid Treatment System - Sources To and Description of "As-Built" System

2.1 Sources and Volumes: TABLE 2.1-1 show the Sources and estimates the volumes of liquid waste to be encountered at ST. LUCIE PLANT, UNIT No. 1 each year.

2.2 General Description: Liquid influents to the liquid treatment of UNIT No. 1 are segregated by chemistry and/or probable radioactivity for more efficient processing. Tritiated, hydrogenated, borated reactor coolant quality wastes of potentially high radioactivity are mainly processed in the boron recovery system. Aerated, chemically contaminated, and low radioactivity liquid wastes are received and processed separately in the liquid treatment system. The attached FIGURES show the components and flows of UNIT No. 1's liquid treatment system.

a. The Boron Recovery System (Shim Bleed): The major influent to the boron recovery system is reactor coolant liquid from the chemical and volume control system letdown that results from feed and bleed operations for shutdown, startups, and boron dilution over core life. In addition, reactor coolant quality water from valve and equipment leakoffs and drains and valves within the containment are collected in the reactor drain tank and subsequently processed by this system. Reactor coolant water from leakoffs and drains in the reactor auxiliary building are also collected in the equipment drain tank treatment and processed by the Shim Bleed System.

TABLE 2.1-1

ST. LUCIE PLANT, UNIT No. 1: SOURCES AND VOLUMES OF LIQUID WASTE

1. Boron Recovery System

Source	Waste Generating Operation	Volume (gal/year)
Chemical and volume control system	Boron reduction for fuel burnup	216,000
	Cold shutdown and startups	332,000
	Hot shutdowns and startups	161,000
	Refueling shutdown and startup	68,000
Resin dewatering	Sluice and dewater 256 ft^3 resin per year at 2 ft^3 water/ft^3 resin	3,800
Reactor coolant leakage	200 gpd for four reactor coolant pumps	62,600
		843,400

2. Liquid Waste System

Source	Waste Generating Operation	Volume (gal/year)
Equipment drains and leakage	75 gal/day	28,000
Sample and laboratory sink drains	20 gal/day	7,000
Equipment decontamination	10 gpm for 20 minutes per day	73,000
Floor drains	5 gpm for 10 minutes per day	18,000
Fuel cask washdown	400 gal/cask per refueling	30,000
Sub-Total		156,000
Laundry	200 gal/day	73,000
Showers	4 showers per day at 30 gal per shower	44,000
TOTAL	Estimated normal operation	273,000

The borated and hydrogenated water, either discharged through the reactor drain pumps or diverted from the chemical and volume control system tank through a diversion valve, is sent to a flash tank where dissolved hydrogen and fission gases are stripped from the liquid by a countercurrent flow of nitrogen gas and discharged to the gas decay tanks of the gaseous waste system. The degassed liquid is automatically pumped from the flash tank to holdup tanks which provide storage capacity large enough to accumulate a sufficient volume of liquid for processing by a boric acid concentrator (evaporator) on a batch basis.

The contents of the holdup tanks are transferred to the evaporator through a preconcentrator filter and ion exchanger into a preheater. The preheated boric acid solution is pumped into the evaporator and boiled. The boron concentration increases as water is evaporated off and, at periodic times, the concentrated fluid (bottoms) is pumped out of the evaporator into a boric acid tank for temporary storage and sampling. The recovered boric acid may then either be returned to a makeup tank for recycle or discharged to the drumming station for solidification and ultimate offsite disposal. If plant reuse is carried out, the fluid is analyzed for chemical acceptability and radioactivity levels.

b. Clean and Dirty Waste Systems: At UNIT No. 1, although separate collection tanks are provided for these two influent streams, the

clean and dirty wastes are processed through the same processing equipment. However, in the calculations used to demonstrate compliance, the two systems are treated as separate systems.

These liquid wastes contain dissolved solids and/or radioactive nuclides and are collected from either the equipment drain, chemical drain, laundry drain and/or aerated waste storage tanks. They are passed through a waste filter prior to entering the waste evaporator. Low pressure steam heats the waste solution in the evaporator to produce water vapor and liquid waste solution which pass into the vapor separator. Boric acid is scrubbed out of the water vapor by spraying recycled distillate over demisters and the water vapor condensed in a vapor condenser and cooled by a distillate coller.

The distillate is collected and isolated in a condensate holdup (monitor) tank. After a laboratory assay has determined that the radioactivity of the distillate is low enough for discharge, the distillate is pumped at a controlled rate through a radiation monitor into the circulating water discharge. If discharge criteria are not met, the distillate is recirculated through a waste ion exchanger and returned to the condensate holdup tank for reanalysis. If discharge criteria cannot be met by processing through the waste ion exchanger, the distillate is returned to holdup tanks or/and the evaporator for further reprocessing.

Evaporator bottoms are pumped to the drumming station for

solidification and disposal for burial. Solids content and specific radioactivity levels govern the discharge of evaporator bottoms.

c. Steam Generator Blowdown: Steam generator blowdown from a PWR does not contain any significant radioactivity unless there is a simultaneous release of radioactivity from steam generator tube leakage and increased fuel failures. Under normal operating conditions at UNIT No. 1, the blowdown is monitored and discharged to the circulating water system. If the radioactivity exceeds acceptable limits, the blowdown is automatically diverted to the Steam Generator Blowdown Treatment Facility and processed by a filtration and a 2-stage ion exchanger train and collected in holdup tanks. The processed blowdown is then sampled for radioactivity and either recycled to the plant or discharged through a radiation monitor to the circulating water system.

d. Turbine Building Drains: UNIT No. 1's turbine building is a completely open structure. The liquids in its drains are not treated since they contain very low levels of radioactivity, even if there has been some steam generator tube leakage. However, allowances have been taken in these compliance demonstration calculations for the contribution of this stream to total liquid discharges.

e. Laundry Wastes: These wastes (detergent and personnel hot shower wastes) are collected in the laundry drain tanks and

analyzed for radioactivity. If the radioactivity does not exceed established limits, the liquid is pumped from the tanks through a filter and into the circulating water discharge. Should the radioactivity exceed permissible discharge limits, the laundry wastes are pumped to the waste evaporator for processing.

2.3 Tank Capacities In The Liquid Treatment System: These are the capacities of the components that makeup the ST. LUCIE PLANT, UNIT No. 1 Liquid Treatment System:

Component	No. of Units	Volume
CVCS Holdup Tanks	4	40,000 gal, ea.
CVCS Evaporator	2	20 gpm
CVCS Cond. Holdup Tanks	2	7,300 gal, ea.
CVCS Boric Acid Holding Tank	1	2,400 gal.
Dirty Waste Equipment Drain Tank	1	1,000 gal.
Dirty Waste Evaporation	1	2 gpm
Dirty Waste Cond. Tank	2	1,600 gal, ea.
SGB - Hold Tanks	3	180,000 gal, ea.
Chemical Drain Tank	1	1,000 gal.
Aerated Waste Storage Tank	1	40,000 gal.
Laundry Drain Tank	2	2,000 gal, ea.
Equipment Drain Tank	1	1,000 gal.
Spent Resin Storage	1	8,000 gal.

3.0 Solid Wastes - Description of System

3.1 General: This section elaborates on the source of solid wastes and the methods and equipment used in packaging such materials for transport to a burial ground.

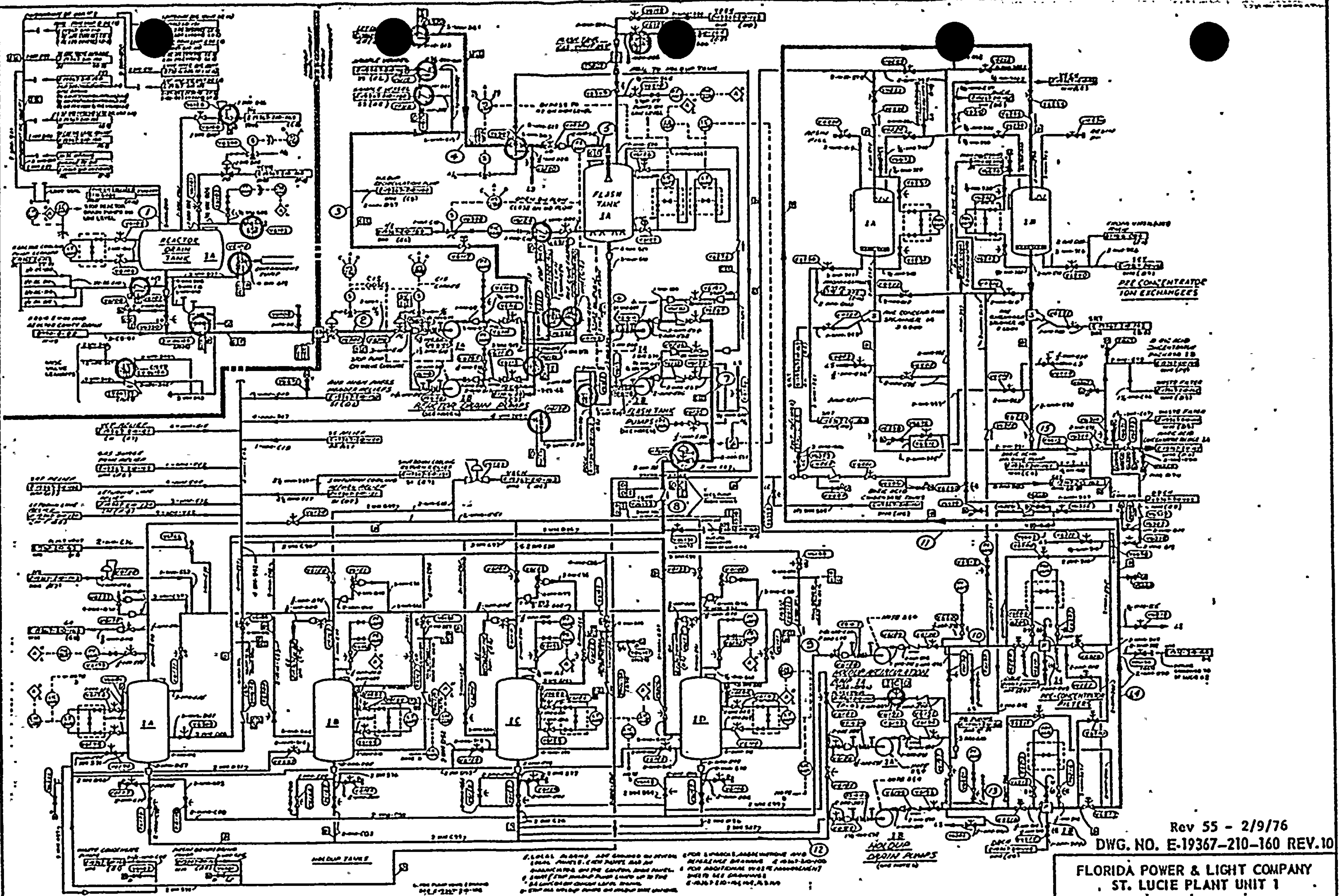
3.2 The System and Types of Materials Handled:

a. The solid waste system is shown in the attached FIGURES. Concentrate from the waste evaporator is pumped directly from the evaporator to the drum fill station. The boric acid evaporator bottoms from either evaporator can be bypassed around the boric acid holding tank directly to the drumming station while the other boric acid evaporator bottoms are being processed through the boric acid holding tank. This bypass can be used to return re-concentrated boric acid directly to the boric acid makeup tanks in the chemical and volume control system (CVCS) in the event of problems with the holding tank.

At the drumming station, the concentrate from either the waste evaporator or one of the boric acid evaporators enters a shipping drum. The liquid waste quantity from the concentrators is assumed to result from 156,000 gallons of miscellaneous liquid waste. This waste is concentrated in approximately 230-55-gallon drums.

Because most of the 156,000 gallons of water that would enter the liquid waste system is a result of decontamination operations and floor washdowns, the radioactivity is diluted significantly by uncontaminated wash water. Consequently, the aerated waste influent activity is approximately 1 percent of the reactor coolant activity.

No credit is taken for activity removal by the waste filter in evaluating evaporator bottoms activities. Except for tritum, the concentrate activities are a factor of 20 above influent activities. Tritium concentration is one hundredth of the total ^3H influents. Steam generator blowdown due to primary to secondary leakage is processed similarly to liquid wastes. Approximately 3,700 gallons per year of waste steam generator leak for normal operation (0.1 percent failed fuel). The shipped volume of solidified waste is approximately 733 ft^3 requiring 105-55-gallon drums. The anticipated operational occurrence with a steam generator leak of 120 gpd results in approximately 22,000 gal/yr of bottoms and 4,360 ft^3 of solidified waste.



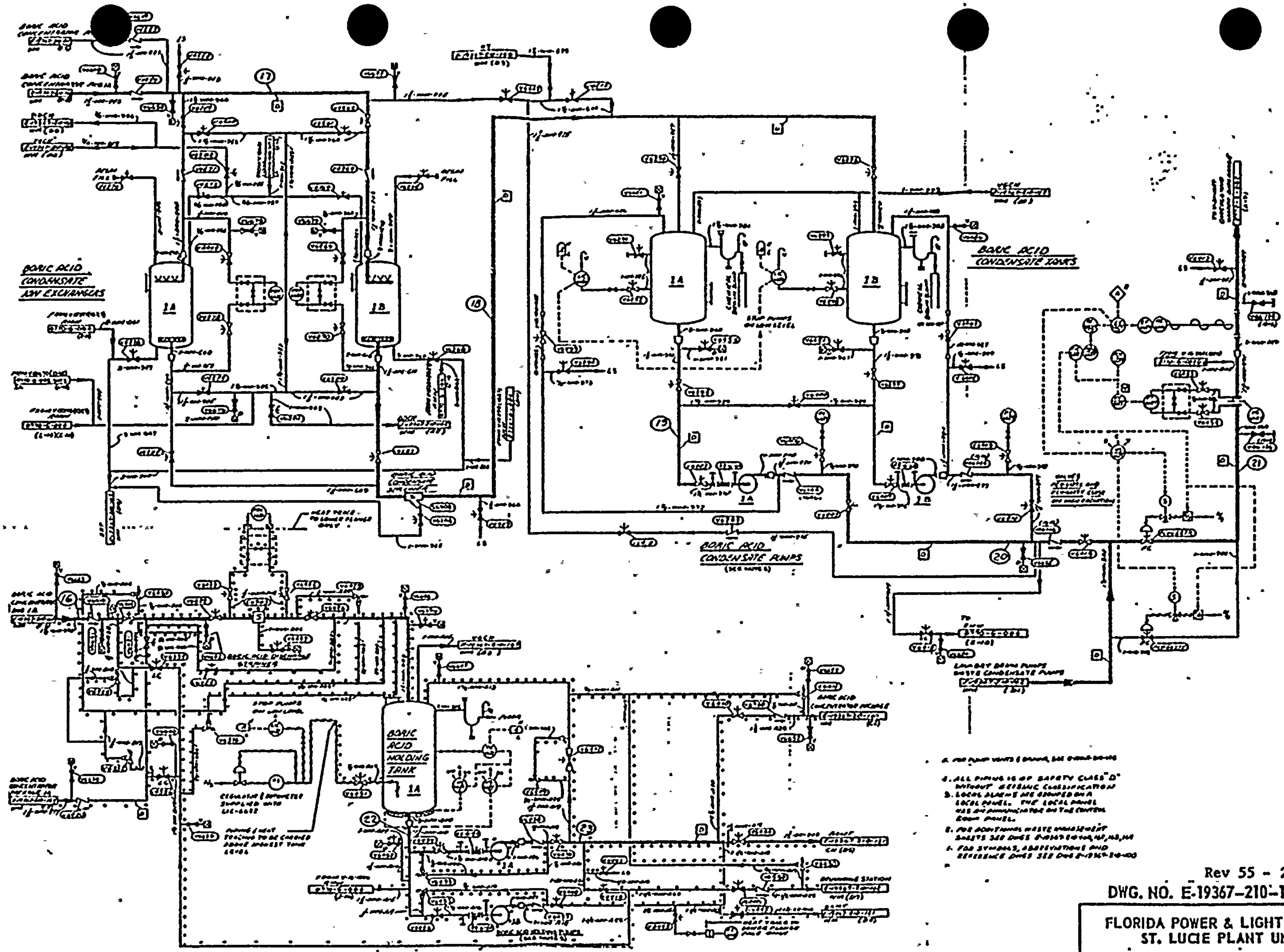
Rev 55 - 2/9/76

DWG. NO. E-19367-210-160 REV.10

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 1

WASTE MANAGEMENT SYSTEM
P&ID

1A. GASEOUS SYSTEM



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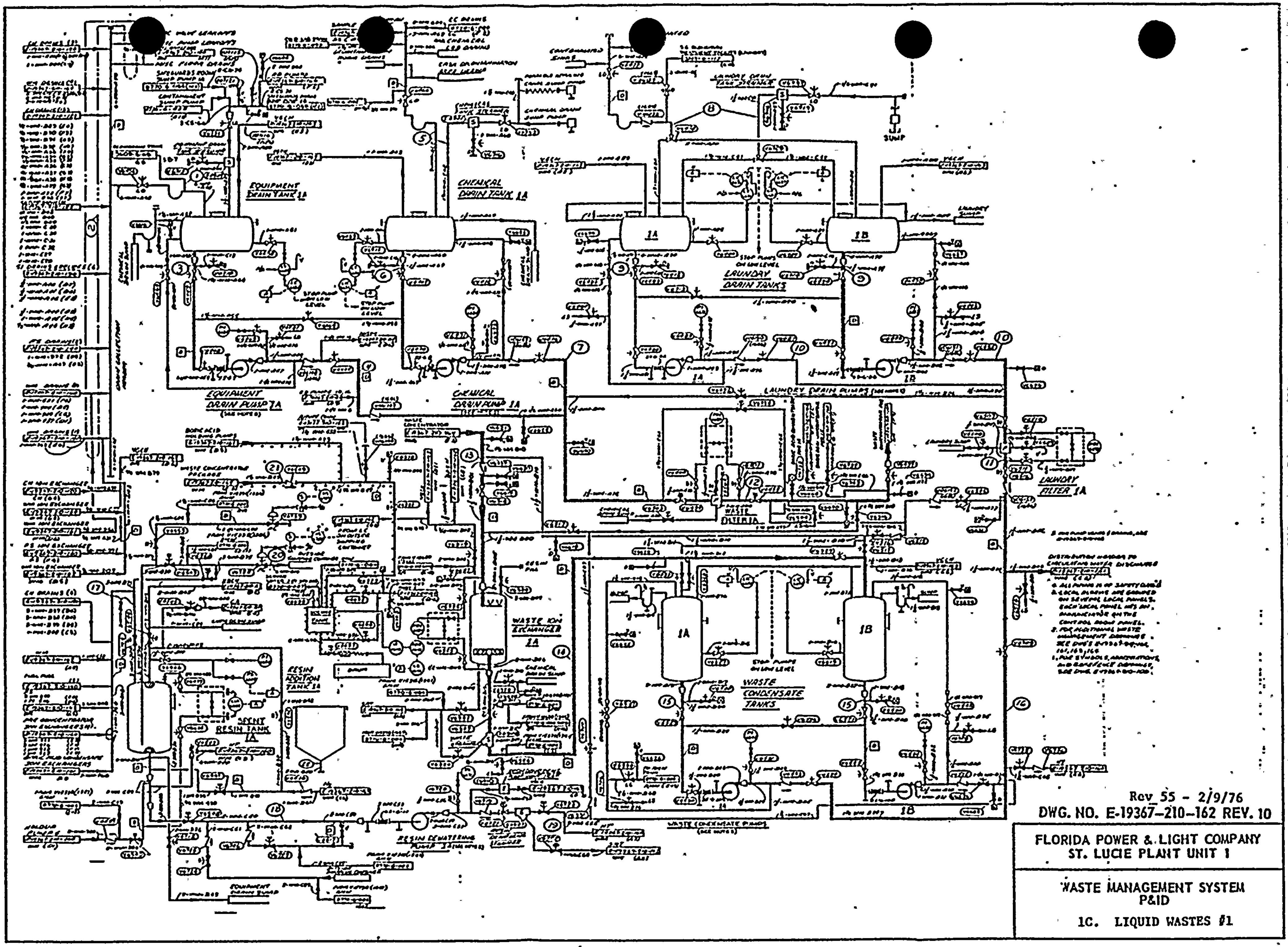
ST. LUCIE PLANT UNIT 1

WASTE MANAGEMENT SYSTEM
P&ID

1B. SHIM BLEED



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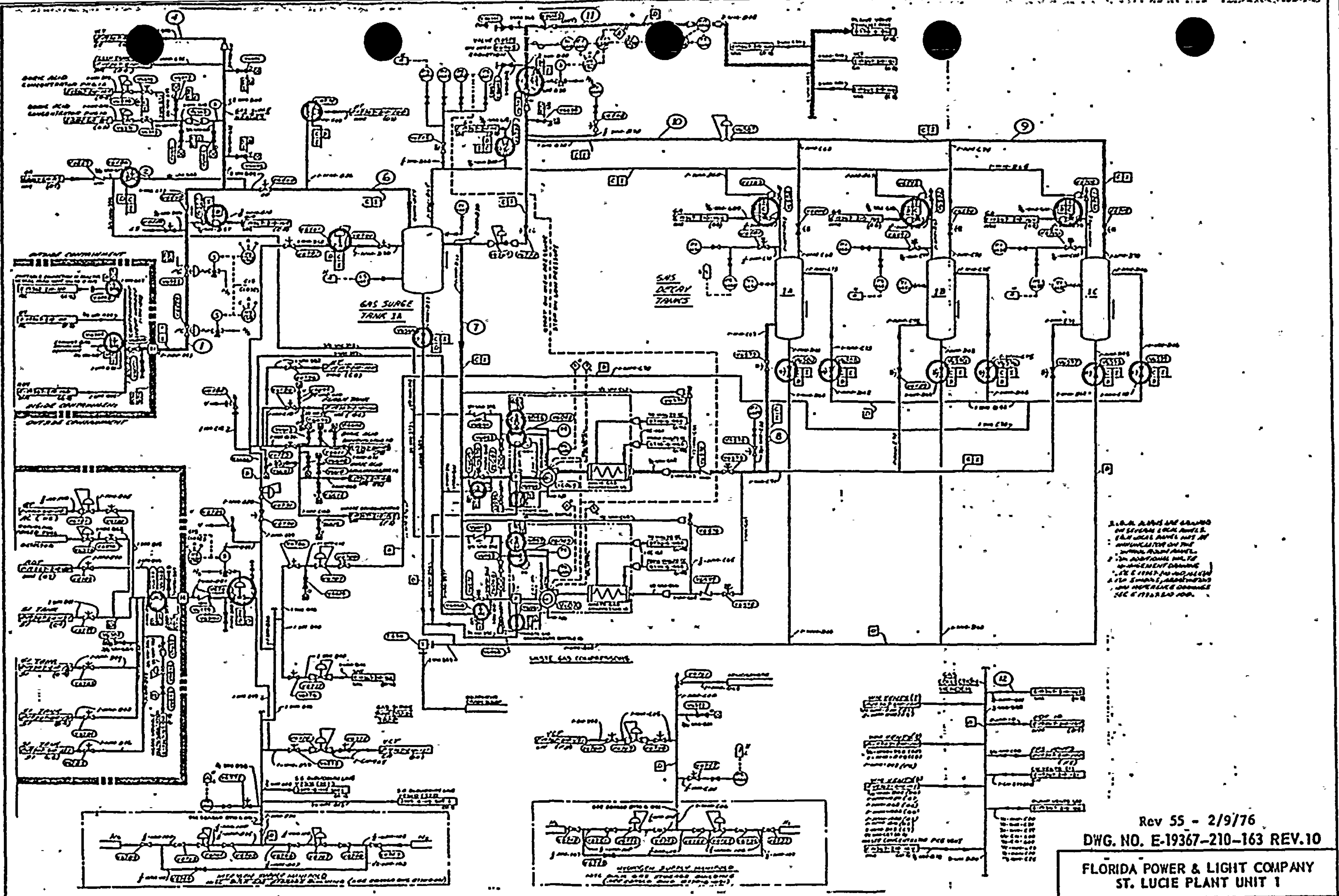
DWG. NO. E-19367-210-162 REV. 10

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 1

WASTE MANAGEMENT SYSTEM
P&ID

1C. LIQUID WASTES #1



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DWG. NO. E-19367-210-163 REV.10

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT UNIT 1

WASTE MANAGEMENT SYSTEM
P&ID

1D. LIQUID WASTES #2

ATTACHMENT C

ST. LUCIE PLANT, UNIT No. 1: STEAM GENERATOR BLOWDOWN SYSTEM (SGBS)

1.0 SYSTEM DESCRIPTION

1.1 GENERAL

Steam generator blowdown is utilized to maintain the total dissolved solids (TDS) content of steam generator secondary side coolant within normal operating limits. Primary to secondary leakage can result in some activity accumulation within the steam generator secondary. Should this activity level exceed a specified limit the blowdown stream would be processed prior to its release via the discharge canal. Three blowdown process streams provide this capability. Each stream can process the total combined blowdown (40 gpm or greater) from both UNITS 1 and 2.[a]

During the period prior to the operation of the new blowdown treatment facility, steam generator blowdown at UNIT No. 1 will be sent to the blowdown flash tank. A blowdown sample stream is continuously monitored by a process radiation monitor. If the monitor indicates that the radionuclide concentrations are acceptable the blowdown will be discharged to the circulating water discharge. If not, the blowdown is automatically terminated and can be routed to the equipment drain tank in the reactor auxiliary building for processing in the liquid radwaste treatment system. The gaseous emissions from the blowdown flash tank vent will be continuously discharged via the blowdown flash tank vent.

The SGBS is required to support normal operations. It is not required to achieve a safe shutdown, or mitigate the consequences of an accident.

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[a] The facility is being provided on a backfit basis and is expected to become operational in 1977.

1.2 DESCRIPTION

A SGBS process and instrumentation diagram is provided in the attached FIGURE. Normally the blowdown from the steam generators is cooled in a closed blowdown heat exchanger. These heat exchangers eliminate the need for a blowdown storage tank and its atmospheric vent. Blowdown pressure is then a spare process stream which becomes available to reprocess liquids recirculated from a monitor tank should reprocessing be required.

Blowdown sent to a process stream passes through a blowdown filter where suspended solids are removed. It then enters the blowdown demineralizer system where the concentration of exchangeable ions in the coolant is reduced significantly. The processed blowdown stream passes through a resin trap enroute to a monitor tank. Since the decontamination factor of the process stream is more than sufficient to achieve activity levels acceptable for release, the monitor tanks may be pumped directly to the discharge canal. The activity of this discharge stream is monitored and the capability for automatic isolation is provided. Provisions are also provided to allow the monitor tank contents to be recycled to the plant for use as makeup. Low water level in a monitor tank will automatically terminate discharge from that tank.

The blowdown demineralization system consists of a cation bed demineralizer and a mixed-bed demineralizer connected in series. The cation resin used in the cation and mixed-bed demineralizers is a high capacity, strong acid exchange resin in the H^+ form. The mixed-bed anion

resin is a high capacity, Type I, strong-base exchange resin of the OH^- form. Spent ion exchange resins are gravity fed to a spent resin storage tank for temporary storage prior to disposal as a solid waste.

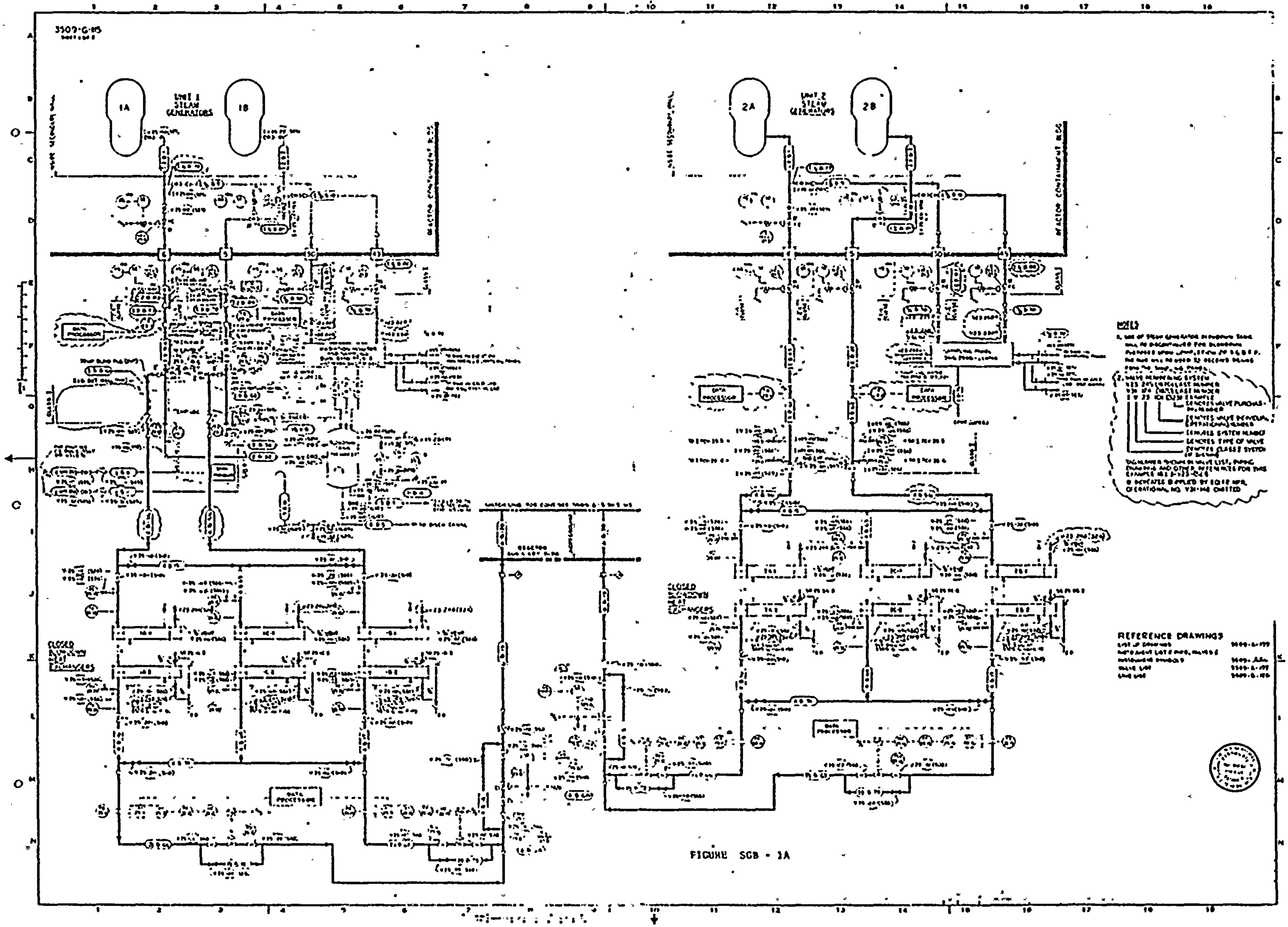

FIGURE SGB - 1A

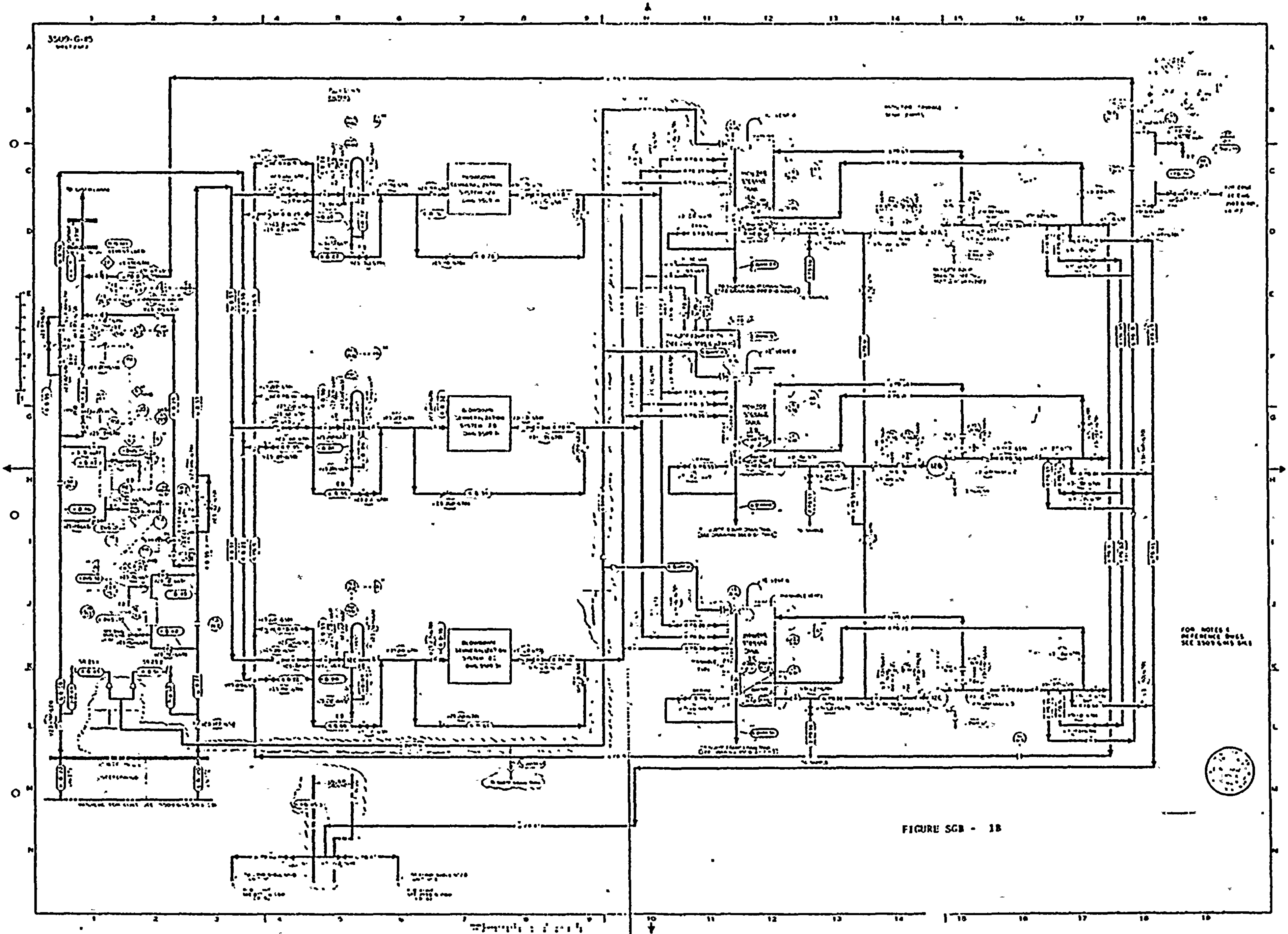

FIGURE SGB - 1B

SUPPLEMENT B

ST. LUCIE PLANT, UNIT No. 1:
AGRICULTURAL and MARINE FOODS
PRODUCTION DATA APPLICABLE TO
PLANT AREA

ABSTRACT

The data appearing in this report has been compiled with assistance from Federal, State and County agencies and services. It establishes base knowledge about the current agricultural and marine life productivity and harvests in those counties adjacent to the ST. LUCIE PLANT site, i.e. principally St. Lucie, Martin, Indian River, Palm Beach, Broward and Okeechobee counties. Some data from counties like Glades, Hendry and Brevard also have been included in this report. Most of these data were developed to provide inputs to and in the individual and population doses computations required to prove compliance of FLORIDA POWER and LIGHT COMPANY's nuclear power reactors at ST. LUCIE PLANT with APPENDIX I, 10CFR50.

The information presented has been organized to give data about these following activities:

- Commercial Vegetable Production
- Citrus and Other Commercial Fruit Harvests and Processing
- Commercial Honey Production
- Cane Sugar Production
- Dairy Herds and Milk Production
- Beef Cattle Production and Distribution
- Poultry Production
- Food Fish, Shrimp and Shellfish Landings

TABLE OF CONTENTS

COMMERCIAL

VEGETABLE

PRODUCTION

TABLE I

FLORIDA COMMERCIAL VEGETABLES - Planting and Harvest Seasons[a]

	Species	Planting Season	Harvest Season	Most Active Harvest Season
1)	Beans	Aug. - Apr.	Oct. - June	Nov. - May
2)	Cabbage	Sept. - Mar.	Oct. - June	Jan. - May
3)	Carrots	Aug. - Feb.	Nov. - June	Dec. - May
4)	Celery	Aug. - Apr.	Oct. - July	Dec. - June
5)	Chinese Cabbage	Sept. - Apr.	Oct. - June	Nov. - May
6)	Corn	July - May	Sept. - July	Nov. - June
7)	Cucumbers	Aug. - Apr.	Sept. - July	Nov. - Dec. Apr. - June
8)	Eggplant	July - Apr.	Oct. - Aug.	Nov. - July
9)	Escarole	Aug. - Apr.	Oct. - June	Nov. - May
10)	Lettuce	Aug. - Apr.	Oct. - June	Dec. - May
11)	Peppers	Aug. - Mar.	Oct. - July	Nov. - June
12)	Potatoes	Sept. - Mar.	Jan. - July	Jan. - June
13)	Radishes	Sept. - May	Sept. - June	Nov. - May
14)	Squash	Aug. - Apr.	Sept. - July	Nov. - May
15)	Tomatoes	July - Mar.	Oct. - July	Nov. - June
16)	Strawberries	Oct. - Nov.	Dec. - May	Feb. - Apr.
17)	Watermelons	Dec. - Apr.	Apr. - July	May - July

[a] From "Florida Agricultural Statistics - Vegetable Summary, 1974," Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803 (March, 1975)

TABLE II

FLORIDA COMMERCIAL VEGEYABLES - Estimated Net Weight of Shipment Units[a]

Commodity	Unit	Net Wt. lbs./unit	Average Yield Per Acre Units	lbs.	kgs.
Beans	Bushel	30	102	3,060	1,390
Cabbage	Crate	50	480	24,000	10,909
Celery	Crate	60	641	38,460	17,482
Corn	Crate	42	237	9,954	4,525
Cucumbers	Bushel	48	340	16,320	7,418
Eggplant	Bushel	33	720	23,760	10,800
Escarole	Crate	25	516	12,900	5,864
Lettuce	Cwt.	100	171	17,100	7,773
Peppers	Bushel	25	660	16,500	7,500
Potatoes	Sack	100	181	18,100	8,227
Radishes	Carton	11.5	322	3,703	1,638
Squash	Bushel	42	149	6,258	2,845
Strawberries	Flat	10.25	1,321	13,540	6,155
Tomatoes	Carton	30	730 (491)	21,900 (14,730)	9.955 (6,695)[b]
Watermelons	Cwt.	100	150	15,000	6,818
Spinach	Tons	2,000	4,8	9,600	4,364
Okra	Bushel	50	550	27,500	12,500
Southern Peas	Bushel	45	500	22,500	10,227

[a] 1974 data from "Florida Agricultural Statistics - VEGETABLE Summary 1974," Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Floirda, March, 1975.

[b] Data from Dade County Cooperative Extension Department, Homestead, Florida.

TABLE III

FLORIDA COMMERCIAL VEGETABLES[(a)]
Production In Counties Adjacent to ST. LUCIE PLANT[(b)]

County	Principal Species	Production Center	Acres Harvested 1974	Harvest Mass[(a)] Pounds	Kilograms
Brevard	Tomatoes	Ft. Pierce	700[(c)]	15.3(6)[(d)]	6.97(6)[(e)]
	Watermelons		200[(c)]	3.0(6)	1.36(6)
Indian River	Tomatoes	Ft. Pierce	700[(c)]	15.3(6)	6.97(6)
	Watermelons		200[(c)]	3.0(6)	1.36(6)
Okeechobee	Tomatoes	Pahokee	1,160	25.4(6)	11.50(6)
	Watermelons		1,000[(e)]	15.0(6)	6.82(6)
St. Lucie	Tomatoes	Ft. Pierce	875	19.2(6)	8.71(6)
	Watermelons		200[(c)]	3.0(6)	1.36(6)
Martin	Tomatoes	Stuart	500[(c)]	11.0(6)	4.98(6)
	Watermelons		200[(e)]	3.0(6)	1.36(6)
	Cabbage		(1,010)[(c,f)]	—	—
	Potatoes		(1,200)[(f)]	—	—
Palm Beach (East)	Beans	Pompano	19,340	59.2(6)	26.90(6)
	Corn		16,700	166.2(6)	75.56(6)
	Cucumbers		1,070	17.5(6)	7.94(6)
	Egg Plant		820	13.5(6)	6.15(6)
	Peppers		2,200	36.3(6)	16.50(6)
	Squash		1,350	8.4(6)	3.84(6)
	Tomatoes		1,413	30.9(6)	14.07(6)

TABLE III (cont'd)

County	Principal Species	Production Center	Acres Harvested 1974	Harvest Mass[a] Pounds	Kilograms
Palm Beach (West)	Beans	Pahokee	200	0.6(6)	0.28(6)
	Cabbage		1,010[g]	24.2(6)	11.02(6)
	Celery		8,690	334.2(6)	151.91(6)
	Corn		24,000	238.9(6)	108.59(6)
	Escarole		4,750	61.3(6)	24.86(6)
	Spinach		1,300[h]	12.4(6)	5.68(6)
	Lettuce		5,680	97.1(6)	44.15(6)
	Potatoes		1,200[g]	21.7(6)	9.87(6)
	Radishes		13,300[i]	49.2(6)	22.39(6)
Broward	Beans	Pompano	6,900	21.1(6)	9.60(6)
	Egg Plant		260	6.2(6)	2.81(6)
	Peppers		100	1.7(6)	0.75(6)
	Squash		240	1.5(6)	0.68(6)
	Tomatoes		635	13.9(6)	6.32(6)
Hendry	Cucumbers	Pahokee	900	14.7(6)	6.68(6)
	Peppers		1,500	24.8(6)	11.25(6)
	Tomatoes		2,720	59.6(6)	27.08(6)
	Watermelons		2,200	33.0(6)	15.00(6)
Glades	Tomatoes		1,125	24.6(6)	11.20(6)

TABLE III (cont'd)

[a] From "Florida Agricultural Statistics - Vegetable Summary, 1974," Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803 (March, 1975)

[b] Broward, Brevard, Indian River, Okeechobee, St. Lucie, Martin, Palm Beach, Hendry, Glades and Counties

[c] From County Agent

[d] (6) = x 1,000,000

[e] Estimated from information presented in a.

[f] Included in Palm Beach County data

[g] Includes Martin County data

[h] Total acreage for 1974 not disclosed; 1973 acreage harvested was 1300 acres and total--assumed to mostly in Palm Beach County (West)

[i] Total state acreage in 1973-74 was 26.600 acres; assumed 1/2 of production was in Palm Beach County (West)

TABLE IV: PART 1

FLORIDA COMMERCIAL VEGETABLES

Shipments and Distribution,

1973-74 Season [a,b]

Species	BEANS	CABBAGE	CARROTS	CELERY	CHINESE CABBAGE	CORN
Total Shipments [c]	4,060	11,684	1,240	7,908	436	13,071
Major Reception Areas and % of total rec'd. that area:						
Albany	(d)					1.2
Atlanta	7.2	8.3	14.0	3.6		6.8
Baltimore		6.1		3.3		3.7
Birmingham		5.9	6.4	1.9		2.4
Boston	5.4	6.9	6.8	5.4	13.2	5.7
Buffalo				1.8		1.0
Chicago	5.3	3.5	8.3	4.1	8.0	9.3
Cincinnati	3.4	2.5				4.4
Columbia, S. C.	3.9	5.3	9.5			2.6
Dallas						4.4
Denver						1.5
Detroit	4.0	1.8		4.2		5.2
Ft. Worth						
Houston						2.7
Indianapolis				1.5		2.5
Kansas City						3.9
Los Angeles						9.0
Louisville			7.7	2.1		2.7
Memphis				1.4		1.7
Miami	5.3	4.4	17.8	6.0	5.2	6.7
Milwaukee						
Minneapolis					4.2	2.2
Nashville						
New Orleans			5.8	2.7		3.9
New York City	18.4	20.2	6.0	17.6	20.2	17.8
Oklahoma City						
Philadelphia	6.0	12.4	7.0	7.0	6.6	7.7
Pittsburgh		4.6		3.3		3.3
Portland, Ore.						
Providence		1.4				

TABLE IV: PART 1
(cont'd)

Species	BEANS	CABBAGE	CARROTS	CELERY	CHINESE CABBAGE	CORN
Total Shipments[(c)]	4,060	11,684	1,240	7,908	436	13,071
St. Louis				2.5		5.3
San Francisco						2.5
Seattle						
Washington, D. C.	3.3	5.4	4.8	5.2	7.1	4.9
Montreal	4.3	4.4		5.8		2.6
Ottawa				1.8		
Toronto	6.6	1.7		8.3		2.0
Vancouver					1.9	
Winnipeg						
Cleveland		4.3		2.3		
Salt Lake City						1.1
San Antonio						1.7

a) Source: Florida Crop and Livestock Reporting Service, Orlando, Florida.

b) Season: September, 73 to August, 1974.

c) Total air, boat, rail and truck interstate shipments; truck shipments predominate.

d) All blank spaces indicate > 1% of total shipments.

TABLE IV: PART 2

FLORIDA COMMERCIAL VEGETABLES

Shipments and Distribution,

1973-74 (a,b)

Species	Cucumbers	Egg Plant	Escarole	Lettuce	Peppers	Squash
Total Shipments (c)	5,045	1,255	2,757	1,957	6,642	1,642
Major Reception Areas and % of total rec'd that area:						
Albany	1.7		1.8		1.3	1.0
Atlanta	2.1	2.2		3.3	2.2	6.3
Baltimore	3.8	2.1	1.7		2.0	
Birmingham	(d)					3.8
Boston	9.3	6.8	8.8	6.7	8.7	5.0
Buffalo	1.6		3.1		1.3	1.0
Chicago	8.6	3.7	3.8		4.0	5.3
Cincinnati	3.0				1.9	3.1
Cleveland	2.6		2.5		2.3	1.3
Columbia, S.C.	2.3			5.4	1.4	5.0
Dallas					1.0	6.4
Denver						
Detroit	4.0		1.8		3.0	2.8
Ft. Worth						
Houston						2.8
Indianapolis					1.0	
Kansas City					1.0	1.3
Los Angeles						
Louisville				3.5	1.0	1.1
Memphis						1.0
Miami	3.0	4.4	3.0	15.3	3.2	8.1
Milwaukee						
Minneapolis						
Nashville						
New Orleans					1.8	2.1
New York City	23.0	35.2	37.3	24.2	28.1	15.5
Oklahoma City						
Philadelphia	8.1	6.8	8.1	5.9	8.7	3.6
Pittsburgh	5.1	3.8	4.2	4.1	4.3	2.3
Portland						
Providence		1.2		1.8	1.0	1.2

TABLE IV: PART 2
(cont'd)

	Cucumbers	Egg Plant	Escarole	Lettuce	Peppers	Squash
St. Louis		1.2				
Salt Lake City						
San Antonio						
San Francisco						
Seattle						
Washington, D. C.	3.4	4.5	3.0	7.8	2.7	3.5
Montreal	2.7	4.3	6.4	4.1	5.3	2.0
Ottawa				1.0		1.0
Toronto	2.0	6.9	6.0	1.1	5.2	1.9
Vancouver						
Winnipeg						

[a] Source: Florida Crop and Livestock Reporting Service, Orlando, Florida

[b] Season: September, 1973 to August, 1974

[c] Total air, boat, rail and truck interstate shipments; truck shipments predominate

[d] All blank spaces indicate > 1% of total shipments

TABLE IV: PART 3

FLORIDA COMMERCIAL VEGETABLES

Shipments and Distribution,

1973-74 Season[a,b]

Species	RADISHES	TOMATOES	POTATOES	STRAWBERRIES	WATERMELONS
Total Shipments[c]	2,596	14,819	9,911	361	13,011
Major Reception Areas and % of total rec'd that area:					
Albany	(d)		1.0		1.0
Atlanta	1.3	3.8	13.4	6.6	3.0
Baltimore	1.4	2.4	3.3	4.7	2.4
Birmingham		1.5	4.2		2.4
Boston	2.9	10,0	1.6	6.9	2.9
Buffalo		1.1	1.1		1.7
Chicago	3.5	6.2	5.4	1.4	2.9
Cincinnati	43.6	2.6	5.7	1.5	2.8
Cleveland	1.8				2.8
Columbia, S. C.		7.2	4.4		6.2
Dallas	1.8		1.1		
Denver					
Detroit		3.4	9.2		4.1
Ft. Worth					
Houston			1.1		
Indianapolis	1.9	1.6			1.0
Kansas City	1.6				
Los Angeles		1.6	1.7		
Louisville		1.9	4.1		1.0
Memphis	2.3		1.1		
Miami	1.8	4.9	2.9	28.3	1.7
Milwaukee			1.1		
Minneapolis	2.2				
Nashville		1.6		3.9	1.0
New Orleans		1.0	3.1		1.5
New York City	4.5	14.7	3.1	22.2	16.7
Okalhoma City					
Philadelphia	2.2	9.6	5.2	8.3	4.3
Pittsburgh	3.3	3.9	2.9		2.8
Portland					
Providence		1.2			

TABLE IV: PART 3 (cont'd)

	RADISHES	TOMATOES	POTATOES	STRAWBERRIES	WATERMELONS
St. Louis	3.0		1.3		1.0
Salt Lake City					
San Antonio		1.2			
Seattle			1.0		
Washington, D. C.	1.7	2.4	9.8	13.3	2.8
Montreal	3.6	5.7	1.0		2.5
Ottawa	1.0	1.0	1.0		
Toronto		3.2	1.3		3.0
Vancouver			1.0		
Winnipeg	1.0	1.0			

a) Source: "Florida Agricultural Statistics - Vegetable Summary, 1974," Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803 (March, 1975)

b) Season: September, 1973 to August, 1974

c) Total air, boat, rail and truck interstate shipments; truck shipments predominate.

d) All blank spaces indicate > 1% of total shipments.

CITRUS AND OTHER COMMERCIAL FRUIT HARVESTS AND PROCESSING

TABLE V

CITRUS FRUIT HARVESTS

County	Fruit	Harvest Unit	Unit Weight, lbs.	Units Harvested, 1973-74 (a)	Weight Pounds	Weight Kilograms
Brevard	Round Oranges	box	90	3.91(6) (b)	351.9(6)	160.0(6)
	Temple Oranges	"	90	1.12(5)	10.1(6)	4.6(6)
	Grapefruit	"	85	1.30(6)	110.5(6)	50.2(6)
	Tangerines	"	90	7.0 (3)	0.6(6)	0.29(6)
	Tangelos	"	90	7.60(4)	6.8(6)	3.1(6)
Broward	Round Oranges	"	90	8.95(5)	80.6(6)	36.6(6)
	Temple Oranges	"	90	1.20(4)	0.11(6)	0.05(6)
	Grapefruit	"	85	1.68(5)	14.3(6)	6.50(6)
	Tangerines	"	90	2.0 (3)	0.18(6)	0.08(6)
	Tangelos	"	90	1.5 (4)	0.14(6)	0.06(6)
St. Lucie	Round Oranges	"	90	8.76(6)	788.4(6)	358.4(6)
	Temple Oranges	"	90	8.27(5)	74.4(6)	33.8(6)
	Grapefruit	"	85	8.58(6)	729.3(6)	331.5(6)
	Tangerines	"	90	1.17(5)	10.5(6)	4.8(6)
	Tangelos	"	90	2.13(5)	19.2(6)	8.7(6)

TABLE V (cont'd)

County	Fruit	Harvest Unit	Unit Weight, lbs.	Units Harvested, 1973-74 (a)	Weight Pounds	Weight Kilograms
Indian River	Round Oranges	box	90	4.85(6)	19.2(6)	8.7(6)
	Temple Oranges	"	90	2.58(5)	23.2(6)	10.6(6)
	Grapefruit	"	85	8.11(6)	689.4(6)	313.3(6)
	Tangerines	"	90	5.60(4)	5.04(6)	2.3(6)
	Tangelos	"	90	1.11(5)	10.0(6)	4.5(6)
Martin	Round Oranges	"	90	5.28(6)	475.2(6)	216.0(6)
	Temple Oranges	"	90	1.11(5)	10.0(6)	4.5(6)
	Grapefruit	"	85	1.53(6)	130.1(6)	59.1(6)
	Tangerines	"	90	1.60(4)	1.4(6)	0.65(6)
	Tangelos	"	90	9.60(4)	8.6(6)	3.9(6)
Palm Beach	Round Oranges	"	90	1.96(6)	176.4(6)	80.2(6)
	Temple Oranges	"	90	2.22(5)	20.0(6)	9.1(6)
	Grapefruit	"	85	1.21(6)	102.9(6)	46.8(6)
	Tangerines	"	90	4.0(3)	0.4(6)	0.16(6)
	Tangelos	"	90	1.84(5)	16.6(6)	7.50(6)
Okeechobee	Round Oranges	"	90	6.39(5)	14.5(6)	26.1(6)
	Temple Oranges	"	90	1.2(4)	1.1(6)	0.5(6)

TABLE V (cont'd) Page 3 of 3

County	Fruit	Harvest Unit	Unit Weight, lbs.	Units Harvested, 1973-74 (a)	Weight Pounds	Weight Kilograms
Okeechobee (cont'd)	Grapefruit	box	90	1.70(5)	14.5(6)	6.6(6)
	Tangerines	"	90	9.0 (3)	0.8(6)	0.37(6)
	Tangelos	"	90	1.50(4)	1.4(6)	0.61(6)
Hendry	Round Oranges	"	90	4.95(6)	445.5(6)	202.5(6)
	Temple Oranges	"	90	2.66(5)	23.9(6)	10.9(6)
	Grapefruit	"	85	7.80(5)	66.3(6)	30.1(6)
	Tangerines	"	90	6.9(4)	6.2(6)	2.8(6)
	Tangelos	"	90	1.11(5)	10.0(6)	4.5(6)
Glades	Round Oranges	"	90	4.57(5)	41.1(6)	18.7(6)
	Temple Oranges	"	90	–	–	–
	Grapefruit	"	85	2.30(4)	1.96(6)	0.89(6)
	Tangerines	"	90	7.0(3)	0.63(6)	0.29(6)
	Tangelos	"	90	1.0(3)	0.09(6)	0.04(6)

a) From Indian River Citrus League, Vero Beach, Florida

b) ( ) = to power of 10

TABLE VI

Some Facts About FLORIDA Citrus Fruit Processing[a]

1. Harvesting and Uses

Species	Main Season of Harvest	Uses
SWEET ORANGES		
Queen	Dec. - Mar.	Juice, Sections, Hand-eating
Navel	Nov. - Dec.	..
Hamlin	Nov. - Jan.	..
Parson Brown	Nov. - Jan.	Juice
Pineapple	Dec. - Mar.	Juice
Valencia	Apr. - July	Juice, Sections, Hand-eating
Temple	Feb. - Apr.	Sections, Hand-eating
GRAPEFRUIT		
Burgundy Red	Dec. - Apr.	Sections
Marsh	Dec. - Mar.	Juice, Sections
Duncan	Dec. - Mar.	Juice, Sections
Thomas Pink	Dec. - Mar.	Sections
Ruby Red	Dec. - Mar.	Sections
Foster Pink	Oct. - Feb.	Sections
TANGERINES & TANGERINE HYBRIDS	Oct. - Apr.	Hand-eating
ACID CITRUS FRUITS		
Limes	Most of year	Juice
Lemons	Most of year	Juice
Sour Orange	Dec. - Mar.	Juice
Calamondin	Nov. - Apr.	Juice
Kumquat	Nov. - Mar.	Sections, Hand-eating

TABLE VI (cont'd)

2. Processing

   a. 90% of oranges harvested are processed on the same day into bulk frozen form for warehouse storage prior to packaging for distribution.

   b. Rest of the harvest sold for salad mixtures or are hand eaten.

   c. 30-35% of the grapefruit harvested are processed on the same day into salad mixtures, sections or frozen juice concentrates.

   d. Most of the Acid Citrus Fruits are processed on the same day of harvest into juice concentrates.

3. Fresh Fruit Shipment and Distribution

   a. Fruit is picked and shipped within 3 days.

   b. Shipments are to all areas of the U. S. and Canada: 2-7 days are required to get to distribution centers.

   c. From 2-7 days are required at the distribution center to distribute fruit to consumer markets.

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[a] Information provided by the Indian River Citrus Association, Vero Beach, Florida.

COMMERCIAL HONEY PRODUCTION

TABLE VII

COMMERCIAL HONEY PRODUCTION[(a)]

County	Total Orange & Grapefruit Acres[(b)]	Estimated No. of Hives[(c)]	Production[(d)] lbs.	Kgs.
Brevard	17,164	2,730	4.64(5)[(e)]	2.1(5)
Broward	3,781	600	1.02(5)	0.46(5)
Glades	1,467	240	0.39(5)	0.18(5)
Hendry	20,916	3,325	5.46(5)	2.48(5)
Indian River	49,380	7,850	13.34(5)	6.06(5)
Martin	35,288	5,620	9.53(5)	4.33(5)
Okeechobee	3;763	600	1.01(5)	0.46(5)
Palm Beach	12,465	1,980	3.37(5)	1.53(5)
St. Lucie	65,169	10,368	17.61(5)	8.0(5)
TOTAL	209,393	33,313	56.37(5)	25.6(5)

a) From Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803, (January, 1976)

b) Counties listed support about 27.1% of the State's bee population. Acreage for grapefruit and oranges (County/State = 205,630/772,757 acres) used to compile these data and accepted as representative of the bee population distribution in area of interest.

c) Most of these are migrant colonies. As many as 350 beekeepers from the U. S. and Canada bring in an average of 350 colonies prior to January bloom. Colony kept on site for about 8-week period. Bees from a colony can range from 8-9 miles; most probable range is 1.5-2 miles. Honey production per colony can vary from 140-200 pounds. In some instances, quantities as low as 68 pounds have been recorded.

d) Total State production of honey in 1974-75 estimated at 20,900,000 lbs.; using information in b, above, the counties listed accounted for 5,633,246 lbs..

e) ( ) = to power of 10.

CANE SUGAR PRODUCTION

TABLE VIII

SUGAR PRODUCTION IN FLORIDA (a)

1. ACREAGE

Totally in the Everglades - at least 299,599 acres.

Principal growing areas are in:

a) Palm Beach County (more than 95%)
b) Hendry County
c) Glades County
d) Martin County (estimated 2-3,000 acres)

2. PRODUCTION and HARVEST

a. Normal Production has a pattern of

1) 6-8 crops per year around Lake Okeechobee

2) 3 crops per year in other areas

b. Principal harvest times: Last week in November to April 1.

c. Yield: 30 tons per acre per crop.

d. Crop Facts: 10% is sucrose; 90% residuals (Bagasse)

3. PRODUCTS

a. Sucrose

Refined Sugar
Floating Sugar (powdered)
Liquid Sugar
Raw Sugar

b. Bagasse

Fuel.
Furfural (paints, plastics, chemicals).
Roughage for cattle feed.

4. DISTRIBUTION

a. Most areas of the U. S. and Canada by rail and truck.

b. Liquid sugar principally by tank truck for use in food processing.

TABLE VIII (cont'd)

4. DISTRIBUTION (cont'd)

c. Much of raw sugar output carried by barge to Savannah, Ga. for refinement.

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[a] From Dr. J. D. Miller, USDA Sugar Cane Field Station, Agriculture Research Service, Canal Point, Florida.

DAIRY HERDS AND MILK PRODUCTION

TABLE IX

FLORIDA DAIRY HERDS AND MILK PRODUCTION[(a)]

County	Number of Dairies	Heifers Over 500 lbs.	Under 500 lbs.	Number of Milk Cows	Milk Production ($X10^7$ lbs.)
Broward/Dade	8	1,870	1,280	6,500	6.01
Indian River	4	450	300	1,850	1.73
Martin	8	1,190	1,550	4,540	4.40
Okeechobee	30	7,100	8,910	31,980	29.50
Palm Beach	17	3,220	1,850	10,290	9.98
St. Lucie	4	880	950	3,280	3.05
Glades/Hendry	8	280	380	3,460	3.23
Brevard/ Osceola	9	630	530	3,510	3.58
TOTAL	88	15,620	15,750	65, 410	93.7 (42.59×10^7 kgs)

a) 1974 data from "Florida Agricultural Statistics - Dairy Summary 1974," Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida, (August 1975)

TABLE X

Milk Utilization From Dairy Herds
in Southeastern Florida[a,b]

1. Average Annual Milk Production per Cow = 9,416 lbs. = 4,280 kgs.

2. Milk Fat (average): 3.6%

3. 1974 Annual Milk Production – Southeastern Florida Counties:[a,b,c] 579,000,000 lbs. = 263,181,182 kgs.

4. Milk Utilization – Southeastern Florida Counties:[a,b,c,d]

a) Used on Farm		
1) For milk, cream, butter:	8,908,746 lbs.	= 4,049,430 kgs.
2) Fed to Calves:	8,105,790 lbs.	= 3,684,450 kgs.
b) Retail Milk	7,734,804 lbs.	= 3,515,820 kgs.
c) Sold to Plants for Manufactured Dairy Products	561,792,000 lbs.	= 255,360,000 kgs.

5. Use in Some Specific Manufactured Products – Southeastern Florida Counties:[a,b,c,e]

a) Frozen Products – ice cream, ice milk, sherbert	99,527,624 lbs.	= 45,239,829 kgs.
b) Cottage Cheese – curd, creamed	15,401,232 lbs.	= 7,000,560 kgs.
c) Skim Milk and Butter – milk products	40,082,504 lbs.	= 18,219,320 kgs.
d) Whole Milk Products	101,294,732 lbs.	= 46,043,060 kgs.

TABLE X (cont'd)

NOTES:

a. Broward, Dade, Indian River, Martin, Okeechobee, Palm Beach, St. Lucie, Glades and Hendry Counties. Broward County includes data from Dade County; Brevard and Osceola data not included.

b. Estimated 1974 data from "Florida Agricultural Statistics - Dairy Summary, 1974," prepared by Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803, (August, 1975). In some instances, 1973 data from this source has been used.

c. Southeastern Florida Counties account for 30.8% of total STATE milk production.

d. Presentation of data, as given by source (see b), has some variations which account for "higher" total than shown in 3.

e. Estimated 45.6% of total sold for manufactured dairy products; no accounting made for process volume reduction, volume loss in manufacturing, or other manufactured dairy products.

TABLE XI

Per Capita Consumption Of Dairy Products In The United States[a]

Type Milk Product	Average Individual Consumption/Year
Fluid Milk and Cream	247 lbs. = 112.3 kgs.
Cheese (whole and part whole milk cheese)	14.5 lbs. = 6.6 kgs.
Condensed and evaporated milk (unskimmed only)	5.3 lbs. = 2.4 kgs.
Ice Cream	17.5 lbs. = 7.95 kgs.

a) Estimated 1974 data from "Florida Agricultural Statistics - Dairy Summary, 1974," prepared by Florida Crop and Lifestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803, (August, 1975).

BEEF CATTLE PRODUCTION

TABLE XII

FLORIDA BEEF CATTLE PRODUCTION

1. FACTS (1975 Data)[a]:

	Species	STATE TOTAL Head	%
a)	Cows and Heifers (500 lbs and over; that have calved)	1,468,000	55.6
b)	Replacement Cows and heifers (500 lbs. and over)	324,000	12.1
c)	Heifers, steers and bulls under 500 lbs.	640,000	24.0
d)	Steers, 500 lbs. and over (Av: 1100 lbs.)	136,000	5.1
e)	Bulls, 500 lbs. and over	100,000	3.8
		2,668,000	100.0

2. TOTAL CATTLE IN SPECIFIC COUNTIES[b]

County	No. of Head[c]
Brevard	25,000
Broward	30,000
St. Lucie	25,000
Martin	31,000
Indian River	30,000
Okeechobee	40,000
Palm Beach	35,000
TOTAL	216,000

TABLE XII (cont'd)

Notes:

a) From "Florida Agricultural Statistics - Livestock Summary 1974", Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803.

b) Estimated by County Agents of respective counties.

c) Best guesstimate is that "percentage distributions" is equivalent to those shown in Part 1.

POULTRY PRODUCTION

TABLE XIII

FLORIDA'S POULTRY INDUSTRY

1. Some FACTS:[a]

   a) Number on FLORIDA Farms

1)	Hens and Pullets of Laying Age	
	a) One year plus	6,143,000
	b) Pullets	5,810,000
2)	Pullets: 3 mos. to Laying Age	1,930,000
3)	Pullets: Under 3 mos.	2,250,000
	TOTAL	16,083,000

   b) Number of Eggs Produced (Total in STATE) 2,852,000,000

   c) Number of Layers and Eggs by County

	Number of Layers	% of STATE TOTAL	Number of Eggs
Brevard	27,000	0.002	5,704,000
Indian River	<25,000	<0.0016	4,563,200
St. Lucie	<25,000		
Martin	<25,000		
Palm Beach	<25,000		
Okeechobee	<25,000		
Broward	<25,000	<0.0016	4,563,200
Dade	178,000	0.011	31,372,000

   d) No broilers are raised or marketed in the counties shown in c.

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a) 1974 data from "Poultry Summary 1974 - Florida Agricultural Statistics", Florida Crop and Livestock Reporting Service, 1222 Woodward Street, Orlando, Florida 32803.

FOODFISH, SHRIMP and SHELLFISH LANDINGS

TABLE XIV

FLORIDA MARINE LANDINGS: FOOD FISH, SHRIMP AND SHELLFISH

Marine Landings by County, 1973[a]

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
Brevard	Amberjack	4,477	Shrimp	253,964
	Bluefish	62,513	Clams	61,395
	Bluerunner	2,756	Blue Crab	938,214
	Bonito	2,439	Stone Crab	1,940
	Cobia	999	Oysters	19,075
	Sea Catfish	1,418	Scallops	788
	Dolphin	700	Squid	2,820
	Drum (black)	4,325	Turtle (green)	1,334
	Flounder	9,297	Turtle (loggerhead)	10,407
	Goatfish	1,313		
	Grouper (scamp)	33,746		
	Jack (Common)	2,892		
	Jewfish	2,662		
	Kingfish Mackerel	183,014		
	King Whiting	108,080		
	Black Mullet	381,903		
	Silver Mullet	22,168		
	Pompano	14,332		
	Channel Bass	12,363		
	Sea Bass	5,236		
	Sea Trout	57,161		
	Sheephead	38,330		
	Snapper	48,115		
	Spot	80,382		
	Spanish Mackerel	103,077		

TABLE XIV (cont'd)

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
	Triggerfish	1,131		
	Warsaw	4,300		
	UNCLASSIFIED	39,268		
Broward	Grouper	1,347	Shrimp	0
	Kingfish Mackerel	891	Spiny Lobster	10,360[b]
	Mullet (black)	230		
	Sea Trout	199		
	Snapper	946		
	UNCLASSIFIED	212		
Indian River	Amberjack	723	Shrimp	0
	Angelfish	266	Clams	1,025
	Bluefish	37,398	Blue Crab	153,657
	Bluerunner	2,765		
	Bonito	345		
	Cobia	371		
	Dolphin	93		
	Black Drum	1,190		
	Flounder	115		
	Grouper(Scamp)	7,180		
	Jack (common)	505		
	Kingfish Mackerel	330,985		
	King Whiting	3,995		
	Black Mullet	116,048		
	Silver Mullet	778		
	Permit	448		

TABLE XIV. (cont'd)

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
	Pigfish	1,150		
	Pompano	19,620		
	Sea Bass	7,728		
	Sea Trout	33,496		
	Sheephead	1,141		
	Snapper	7,035		
	Spanish Mackerel	48,660		
	Spot	136,260		
	Tripletail	298		
	UNCLASSIFIED	14,490		
Martin	Amberjack	677	Shrimp	0
	Angelfish	340	Blue Crab	33,609
	Bluefish	231,965	Stone Crab	1,000
	Bluerunner	13,537	Spiny Lobster	5,275
	Bonito	439		
	Cobia	331		
	Catfish	2,245		
	Croaker	29,327		
	Dolphin	1,000		
	Drum (black)	13,360		
	Flounder	402		
	Goatfish	31,383		
	Grouper (Scamp)	9,686		
	Grunt	1,023		
	Jack (common)	19,813		
	Kingfish Mackerel	35,109		

TABLE XIV (cont'd)

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
	King Whiting	25,258		
	Black Mullet	78,881		
	Silver Mullet	437		
	Permit	653		
	Pigfish	974		
	Pompano	49,210		
	Sea Bass	3,414		
	Sandperch	68,880		
	Sea Trout	13,500		
	Sheephead	61,235		
	Snapper	8,721		
	Spanish Mackerel	421,565		
	Spot	19,559		
	Tilefish	3,462		
	Tripletail	1,000		
	Warsaw	6,455		
	UNCLASSIFIED	10,239		
Palm Beach	Amberjack	2,391	Shrimp	0
	Angelfish	167	Blue Crabs	593
	Bluefish	117,729	Stone Crabs	1,151
	Bluerunner	14,576	Spiny Lobster	89,677
	Bonito	862	Oysters	2,353
	Cobia	488		
	Croaker	7,552		
	Dolphin	875		
	Black Drum	1,389		

TABLE XIV (cont'd)

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
	Flounder	14,900		
	Goatfish	5,499		
	Grouper (Scamp)	9,256		
	Grunt	545		
	Jack (common)	3,700		
	Jewfish	1,591		
	Kingfish Mackerel	576,819		
	King Whiting	4,845		
	Black Mullet	36,801		
	Silver Mullet	4,100		
	Permit	136		
	Pigfish	91		
	Pompano	21,612		
	Sea Bass	804		
	Sand Perch	12,412		
	Sea Trout	18,681		
	Sheephead	7,589		
	Snapper	80,600		
	Spanish Mackerel	461,600		
	Spot	12,060		
	Tilefish	212		
	Tripletail	237		
	UNCLASSIFIED	11,262		
St. Lucie	Amberjack	4,419	Shrimp	0
	Angelfish	353	Blue Crab	3,909
	Bluefish	177,086	Spiny Lobster	1,561
	Bluerunner	8,193		

TABLE XIV (cont'd)

County	Fish	Weight (kgs.)	Shrimp and Shellfish	Weight (kgs.)
	Cobia	1,681		
	Croaker	1,256		
	Dolphin	2,463		
	Black Drum	842		
	Red Drum	1,367		
	Flounder	531		
	Goatfish	77		
	Grouper (Scamp)	36,350		
	Grunt	386		
	Jack (common)	11,186		
	Jewfish	1,600		
	Kingfish Mackerel	524,080		
	King Whiting	9,127		
	Black Mullet	66,877		
	Silver Mullet	3,322		
	Permit	913		
	Pigfish	633		
	Pompano	34,813		
	Sandpeach	384		
	Sea Bass	383		
	Sea Trout	38,851		
	Sheephead	9,464		
	Snapper	32,906		
	Spanish Mackerel	305,270		
	Spot	93,594		
	Tilefish	10,210		
	Warsaw	6,033		
	UNCLASSIFIED	25,125		

TABLE XIV (cont'd)

a) 1973 data from "Summary of Florida Commercial Marine Landings, 1973", Florida Department of Natural Resources, Division of Marine Resources Bureau of Marine Science and Technology, Tallahassee, Florida.

b) Total Landed; no record made of lobsters harvested from international waters (e.g., Bahamian Archipelago).

c) Individual bait shrimp landed - not food shrimp.

TABLE XV

FLORIDA OYSTER BED ACREAGE[a]

County	Number of Acres Leased	Harvest Pounds	Kilograms
Brevard	1540	41,967	19,075
Indian River	188	4,815	2,189
Martin	100	(b)	(b)
Palm Beach	(b)	5,177	2,353

a) 1973 data from "Summary of Florida Commercial Marine Landings, 1973", Florida Department of Natural Resources, Division of Marine Resources, Bureau of Marine Science and Technology, Tallahassee, Florida

b) No data available

TABLE XVI

FLORIDA Fresh Water Fish Harvests

1. STATE CATCH, 1974[a]

Species	Harvest Pounds	Harvest Kilograms
Catfish	11,251,000[b]	5,114,000
Tilapia (Nile Perch)	795,000	361,365
Bass	>220,000[c]	>100,000
Soft-Shell	133,400	60,635
Other Spaces	unestimated	unestimated

2. ESTIMATED Harvest Figures for LAKE OKEECHOBEE[d,e]

Species	Harvest Pounds	Harvest Kilograms
Largemouth Bass	178,314	81,052
Black Crappie	212,471	96,578
Bream (blue gill, red-ear, warmouth, spotted sunfish)	103,935	47,243
Catfish	1,947,462	885,210
Turtles (soft-shell)	17,713	8,050

TABLE XVI (cont'd) Page 2 of 3

ESTIMATED Catfish Harvest (1974) in Counties Near Plant St. Lucie(a)

County	Harvest Pounds	Harvest Kilograms
Brevard	380	173
Broward	No Record	
St. Lucie	560	255
Martin	1,188	540
Palm Beach	No Record	
Indian River	No Record	
Okeechobee	1,947,462[(f)]	885,210

NOTES:

a) From Mr. E. Snell, National Marine Fisheries Services, Southeast Fisheries Center, Virginia Key, Florida

b) Includes harvest from catfish farms in Northern Florida

c) Mostly large mouth bass from Lake Okeechobee

d) 1975 data from Mr. L. A. Ager, Game and Fresh Water Fish Commission, Taylor Creek Lodge, Okeechobee, Florida

NOTES: (cont'd)

e) Commercial fishing for catfish permitted; all other species caught by sport fisherman. Estimated fish population of lake is 37,000,000. Large percentage these are rough fish, e.g., gizzard shad. Biologists estimate that crappie population is 8,000,000; 400 to 500 thousand were caught in 1974.

f) LAKE OKEECHOBEE harvest assumed here; see notes d and e.

TABLE XVII

Some Facts About FLORIDA

Fish and Shellfish Distributions[a]

1) <u>Distribution</u>

   a) Within Florida <20%

   b) Outside Florida >80%

      1) <u>Major Receiving Points:</u>

         a) New York City
         b) Philadelphia
         c) Other Northeast Cities
         d) Midwest Cities

2) <u>Time Elements Involved</u>

   a) Catch to processing: 1-2 days

   b) Processing to Distribution Center: 1-3 days

   c) Distribution Center to Market to Customer: 1-4 days

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[a] Adapted from information supplied by National Marine Fisheries Service, SOUTHEAST FISHERIES CENTER, 75 Virginia Beach Drive, Virginia Key, Florida.

SUPPLEMENT C

ST. LUCIE PLANT, UNIT No. 1

Cost Estimating Methodology

and

Detailed Cost Estimates

A. Cost Estimating Methodology and Detailed Cost Estimates

(1) The methods used in estimating the cost of an alternate gaseous waste or liquid treatment system are outlined in the following paragraphs.

(2) General Bases

The cost estimates for each substitute system were prepared using wherever possible the cost bases and data presented in NRC Regulatory Guide 1.110.[a]

(3) Direct Installed Costs

In most of the systems studied, Regulatory Guide 1.110 unit cost values were applied, with appropriate adjustments for size or capacity, to the augments considered. In many cases, the unit values were used directly as outlined in the Regulatory Guide. Approximately the same percentage or the same unit costs, as stated in Regulatory Guide 1.110 examples, were applied to the support facilities for each system, i.e., such as building space, piping systems, the electrical system(s) and like components. In some of the systems studied, the equipment sizes or component capacities were not sufficiently close to those of the typical equipment given in the

[a] The United States Nuclear Regulatory Commission's Regulatory Guide No. 1.110, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors", March 1976.

Regulatory Guide to use its cost numbers directly.

In those cases, the estimated costs of equipment were obtained from curves or graphs which were constructed by using various Regulatory Guide 1.110 equipment cost/capacities as specific curve points. In other cases where only one Regulatory Guide 1.110 cost value was shown, estimated costs for the new equipment sizes were obtained by use of an exponential cost/size relationship (such as the "0.6 power curve") which engineering data or literature indicates to be appropriate for the type of equipment under consideration. These curves were projected using the Regulatory Guide 1.110 cost data as the base point.

In those few cases where there was either no Regulatory Guide 1.110 data available or no actual construction cost data at hand, the costs were derived in a standard estimating manner using equipment costs obtained from equipment manufacturers or reliable engineering literature.

In the above cases, the same approximate cost relationships for support facilities such as assigned building space, piping systems, electrical systems, etc. that were used in the Regulatory Guide were

then applied to arrive at the total estimated direct installed cost.

(4) Operating and Maintenance Costs

The annual operating and maintenance costs for the various augments were derived from the Regulatory Guide 1.110 stated costs for like equipment or systems. The approximate equipment capacity/labor attention ranges of Regulatory Guide 1.110 were used. The amounts of the maintenance materials, utilities and services used by a specific system were estimated. The unit costs of these requirements were the same as those outlined in the Regulatory Guide.

(5) Indirect Costs and Annualized Cost of Capital

The multipliers used to obtain the total capital cost of each alternate system and the annualized cost of capital were developed from these statements:

a. Indirect Cost Factor

ST. LUCIE PLANT is a two-unit site; some of the radwaste facilities are unitized and some are shared. In either case per Regulatory Guide 1.110, page 14, the Indirect Cost Factor is 1.75. The estimated installed direct cost for each alternate

system evaluated was multiplied by this factor to obtain the total capital cost.

b. Capital Recovery Factor

Florida Power and Light Company advises that the capital recovery factor to be used for its nuclear facilities is 16.35%.[b]

c. Labor Cost Correction Factor

This facility is to be constructed in FPC Geographic Region III. Per Reg Guide 1.110, page 13, the labor correction factor is 1.0.

(6) Cost Presentation

Direct cost totals are rounded to the nearest whole number; operating and maintenance costs are rounded to the nearest tenth. All costs are expressed in year 1975 dollars.

B. Organization

This document reports the cost estimates developed for the potential use of alternative systems to the gaseous and liquid treatment systems at ST. LUCIE PLANT No. 1. PART I gives data on substitute systems for the plant's gaseous waste system; PART II develops similar data for alternate systems for the plant's "as-built" liquid treatment system.

(b) Letter: Florida Power & Light Company to Dr. W. A. Rodger, NUCLEAR SAFETY ASSOCIATES, dated March 15, 1976; copy attached. (ATTACHMENT A).

PART I: Alternate Gaseous Waste Systems

For convenience, each system has been assigned a designated number and the augment (that is either added or subtracted from the "as-built" system) indicated and described. The alternate gaseous waste systems that have been considered in these cost-benefit analyses were:

System Designation	Components of System Affected	Description of Change
C-1	Gas Decay Train	Add one decay tank
C-2	Gas Decay Train	Increase size of gas decay tanks
C-3	Gas Decay Train	Add HEPA filters
D-1	Aux. Bldg. Ventilation	Add charcoal adsorbers
D-2	Aux. Bldg. Ventilation	Remove HEPA filter
E-1	Containment Purge	Remove kidney
E-2	Containment Purge	Add charcoal adsorbers
E-3	Containment Purge	Remove HEPA filter
F-1	Condenser Air Ejector	Add charcoal adsorbers

Our calculations of the Operating and Maintenance Costs and Total Direct Cost Estimates for each of these substitute systems are given on pages 7 through 62.

Reactor St. Lucie 1 Designated System C-1

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add one gas decay tank (144 ft^3)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			neg	
2. MAINTENANCE MATERIAL AND LABOR			neg	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			neg	
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			neg	

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			neg	*

Note: * per Reg Guide 1.110, p. 50.

Reactor St. Lucie 1 Designated System C-1

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add one gas decay tank (144 ft^3)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	1.1	8.7	9.8	150 ft^3, 165 psig, CS, ASME VIII
2. BUILDING ASSIGNMENT	7.8	3.9	11.7	
3. ASSOCIATED PIPING SYSTEMS	0.5	0.5	1.0	
4. INSTRUMENTATION & CONTROLS			neg	
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS				
SUBTOTAL	9.4	13.1	22.5	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	1.0	1.5	2.5	10%
8. TOTAL DIRECT COSTS	10.4	14.6	25.0	*

* cost bases per Reg Guide 1.110 p. 49 and using 0.6 power cost factor for size change. Use of same labor/equipment/support-facility distribution as Reg Guide 1.110.

Reactor St. Lucie 1 Designated System C-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment increase three present gas decay tank sizes from 144 ft^3 to 200 ft^3 each

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			neg	
2. MAINTENANCE MATERIAL AND LABOR			neg	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			neg	
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			neg	

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			neg	*

Note: *per Reg Guide 1.110, p. 50.

Reactor St. Lucie 1 Designated System C-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment increase three present gas decay tank sizes from 144 ft^3 to 200 ft^3 each

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	.7	5.1	5.8	increase three tanks from 150 ft^3 each; 165 psig, CS, ASME
2. BUILDING ASSIGNMENT	4.6	2.3	6.9	
3. ASSOCIATED PIPING SYSTEMS			neg	
4. INSTRUMENTATION & CONTROLS			neg	
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS			neg	
SUBTOTAL	5.3	7.4	12.7	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	.5	.8	1.3	10%
8. TOTAL DIRECT COSTS	5.8	8.2	14.0	*

* cost bases per Reg. Guide 1.110, p. 49, and use of 0.6 power cost factor for size change. Use of same labor/equipment/support-facility distribution as Reg. Guide.

Reactor St. Lucie 1 Designated System C-3

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add HEPA filtration system to decay tank waste gas release

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.9	20 min/day plus 40 hr annual test
2. MAINTENANCE MATERIAL AND LABOR			0.15	HEPA replacements
3. CONSUMABLES, CHEMICALS, AND SUPPLIES				in items 2 & 4
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other				HEPA disposal

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			2.1	*

Note: * costs per Reg. Guide 1.110, p. 40, values.

Reactor St. Lucie 1 Designated System C-3

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add HEPA filtration system to decay tank waste gas release

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	1.0	11.0	12.0	
2. BUILDING ASSIGNMENT	1.9	1.0	2.9	
3. ASSOCIATED PIPING SYSTEMS	0.7	0.3	1.0	
4. INSTRUMENTATION & CONTROLS				in item 1
5. ELECTRICAL SERVICE	0.7	0.5	1.2	
6. SPARE PARTS		0.2	0.2	
SUBTOTAL	4.3	13.0	17.3	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	.4	1.3	1.3	
8. TOTAL DIRECT COSTS	4.7	14.3	19.0	*

*HEPA costs taken at approximately 50% of Reg. Guide 1.110, p. 39, values.

Reactor St. Lucie 1 Designated System D-1

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal to aux. bldg. vent (70,000) cfm)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.6	
2. MAINTENANCE MATERIAL AND LABOR			31.5	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			-	
4. UTILITIES AND SERVICES				
Waste Disposal			3.5	
Water				
Steam				
Electricity			1.4	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			38.0	*

Note: * per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System D-1

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
HEPA/Charcoal Filters for Ventilation System
Detail Calculation Sheet

Description of Augment add charcoal to aux. bldg. vent (70,000 cfm)

I. COST BASES per Reg Guide 1.110 dated 3/76 (p. 43 typical)

1. Operating Labor, Supervisory and Overhead
   - a) 7 1/2 minutes/shift for HEPA bank = XXXXXXXXXXX
   - b) 7 1/2 minutes/shift for charcoal bank = 135 hours/year
   - c) 40 hours HEPA bank annual test = XXXXXXXXXXX
   - Total = 135 hours/year

2. Maintenance Material and Labor
   - a) HEPA: one change every 2 years @ $150 unit
   - b) prefilter: one change every 2 years @ $150 /unit
   - c) charcoal: one change every 2 years @ $ 900/ unit

3. Consumables, chemicals & supplies
   - a) costs/year = $0.

4. Utilities & Services
   - a) Waste disposal: 1) per HEPA unit: $50
     2) per prefilter unit: $50
     3) per charcoal unit: $100
   - b) Electricity : Additional fan HP for filter @ 0.5 kw/1000 cfm @ $0.018 /kwh = $80 year*/1000 cfm; allow pro-rata $60/yr for HEPA, $20/yr for charcoal

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)*

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   136 hours/year @ $ 12 = $ 1,600 /yr

2. MAINTENANCE MATERIAL AND LABOR
   - 2a. X pref units x 0.5 unit/yr @ $ 150 ea. = $ X /yr
   - 2b. X HEPA units x 0.5 unit/yr @ $150 ea. = $ X /yr
   - 2c. 70 char units x 0.5 unit/yr @ $900 ea. = $31,500 /yr
   - Total = $31,500 /yr

ESTIMATED ANNUAL OPERATING & MAINTENANCE COSTS HEPA continued:

3. CONSUMABLES, CHEMICALS & SUPPLIES Total = $ 0 yr.

4. UTILITIES & SERVICES

Waste Disposal

4a1.	X	pref units x 0.5 unit/yr @ $ 50 ea	= $ X /yr.
4a2.		HEPA units x 0.5 unit/yr @ $ 50 ea	= $ X /yr.
4a3.		char units x 0.5 unit/yr @ $100 ea	= $ 3,500/ yr.
		Total 4a	= $ 3,500/yr.

Electricity

4d. 70 kcfm @ $ 20 /year/kcfm = $ 1,400/ yr.

Notes: (1) HEPA unit = 1000 cfm unit; (2) Charcoal unit = 1000 cfm unit;
(3) Bank = entire group of filters for the total ventilation stream
(4) dollars = year 1975 (5) *continuous operation basis

Reactor St. Lucie 1

Designated System D-1

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal to aux bldg vent (70,000 cfm)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	17	151	168.	
2. BUILDING ASSIGNMENT	23	12	35	
3. ASSOCIATED PIPING SYSTEMS	3	2	5	
4. INSTRUMENTATION & CONTROLS			–	
5. ELECTRICAL SERVICE	13	7	20.	
6. SPARE PARTS		8	8	
SUBTOTAL	56	180	236	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	6	18	24	10%
8. TOTAL DIRECT COSTS	62	198	256.	*

*per detail calculation sheet, next page.

Reactor. St. Lucie 1

Designated System D-1

ESTIMATED DIRECT COSTS--Detail Calculation Sheet
HEPA/Charcoal Filters For Ventilation Systems

Description of Augment add charcoal to aux bldg vent (70,000 cfm)

		Cost Bases	Reference
(1)	Prefilter-HEPA-charcoal filter equipment	= $ 5/cfm	RG, p. 41
(2)	Prefilter-HEPA-filter equipment only (w/o charcoal)	= $ 3/cfm	RG, p. 36
(3)	Charcoal filter equipment value, therefore	= $ 2/cfm	(1) - (2)
(4)	Heater for charcoal @ $400/1000 cfm	=$0.40/cfm	RG, p. 41
(5)	Building space assignment:		
	(6) Prefilter-HEPA-charcoal: for 15000 cfm = 16' x 20' x 12' space = 3840 cu ft = 0.256 cu ft/cfm		RG, p. 41
	(7) Prefilter-HEPA (w/o charcoal): for 15000 cfm = 16' x 12' x 12' space = 2304 cu ft = 0.154 cu ft/cfm		RG, p. 36
	(8) Bldg. space assignment for charcoal only, therefore, = 0.102 cu ft/cfm		(6) - (7)
(9)	Bldg. space value: Auxillary Bldg.	= $ 5/cfm	RG, p. 36
	Turbine Bldg.	= $ 3/cfm	RG, p. 41

(10) CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. PROCESS EQUIPMENT

charcoal filter:	70,000 cfm @ $2/cfm	= $140,000
heater for charcoal:	70,000 cfm @ 40 ¢/cfm	= 28,000
		$168,000

2. BUILDING ASSIGNMENT

   70,000 cfm @ 0.102 cu ft/cfm x $5/cu ft = $ 5,000

3. ASSOCIATED PIPING SYSTEMS

   in item 1.

4. INSTRUMENTS & CONTROLS

   $20,000 allowance

ESTIMATED DIRECT COSTS--Detail Calculation Sheet continued:

5. ELECTRICAL SERVICE

$8000 allowance

6. SPARE PARTS

Notes: (1) RG = Reg.Guide 1.110 dated 3/76; (2) Dollars = year 1975
(3) Labor/material percentages taken at Reg. Guide values.

Reactor St. Lucie 1

Designated System D-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove HEPA from aux bldg vent (70,000 cfm)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			2	
2. MAINTENANCE MATERIAL AND LABOR			10.5	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			-	
4. UTILITIES AND SERVICES				
Waste Disposal			3.5	
Water				
Steam			4.2	
Electricity				
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			20.2	*

*per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System D-2

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
HEPA/Charcoal Filters for Ventilation System
Detail Calculation Sheet

Description of Augment remove HEPA from aux bldg vent (70,000 cfm)

I. COST BASES per Reg Guide 1.110 dated 3/76 (p. 43 typical)

1. Operating Labor, Supervisory and Overhead
   - a) 7 1/2 minutes/shift for HEPA bank = 136 hours/year
   - b) 7 1/2 minutes/shift for charcoal bank =
   - c) 40 hours HEPA bank annual test = 40 hours/year
   - Total = 176 hours/year

2. Maintenance Material and Labor
   - a) HEPA: one change every 2 years @ $150/ unit
   - b) prefilter: one change every 2 years @ $150 /unit
   - c) charcoal: one change every 2 years @ $900 / unit

3. Consumables, chemicals & supplies
   - a) Costs/year: $0

4. Utilities & Services
   - a) Waste disposal: 1) per HEPA unit: $50
     2) per prefilter unit: $50
     3) per charcoal unit: $100
   - b) Electricity : Additional fan HP for filter @ 0.5 kw/1000 cfm @ $0.018 /kwh = $ 80 year*/1000 cfm; allow pro-rata $60 /yr for HEPA, $20 /yr for charcoal

---

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)*

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   176 hours/year @ $12 = $ 5,250 /yr

2. MAINTENANCE MATERIAL AND LABOR
   - 2a. 70 pref units x 0.5 unit/yr @ $150 ea = $ 5,250 /yr
   - 2b. 70 HEPA units x 0.5 unit/yr @ $150 ea = $ 5,250 /yr
   - 2c. X char units x 0.5 unit/yr @ $900 ea = $ X /yr
   - Total = $10,500 /yr

ESTIMATED ANNUAL OPERATING & MAINTENANCE COSTS HEPA continued:

3.	CONSUMABLES, CHEMICALS & SUPPLIES		= $ ____yr.
4.	UTILITIES & SERVICES		
	Waste Disposal		
4a1.	70	pref units x 0.5 unit/yr @ $ 50 ea	= $ 1,750/yr.
4a2.	70	HEPA units x 0.5 unit/yr @ $ 50 ea	= $ 1,750/yr.
4a3.	X	char units x 0.5 unit/yr @ $100 ea	= $ X /yr.
		4a Total	= $ 3,500/yr.
	Electricity		
4d.	70	kcfm @ $ 60 /year/kcfm	= $ 4,200 yr.

Notes: (1) HEPA unit = 1000 cfm unit; (2) Charcoal unit = 1000 cfm unit;
(3) Bank = entire group of filters for the total ventilation stream
(4) dollars = year 1975 (5) *continuous operation basis

Reactor St. Lucie 1 Designated System D-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove HEPA from aux bldg. vent (70,000 cfm)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	21	189	210	
2. BUILDING ASSIGNMENT	18	36	54	
3. ASSOCIATED PIPING SYSTEMS	3	2	5	
4. INSTRUMENTATION & CONTROLS			–	
5. ELECTRICAL SERVICE			–	
6. SPARE PARTS		1	1	
SUBTOTAL	42	228	270	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	4	23	27	10%
8. TOTAL DIRECT COSTS	46	251	297	*

*per detail calculation sheet, next page.

Reactor St. LUCIE 1

Designated System D-2

ESTIMATED DIRECT COSTS--Detail Calculation Sheet
HEPA/Charcoal Filters For Ventilation Systems

Description of Augment remove HEPA from aux bldg vent (70,000 cfm)

	Cost Bases	Reference
(1) Prefilter-HEPA-charcoal filter equipment	= $ 5/cfm	RG, p. 41
(2) Prefilter-HEPA-filter equipment only (w/o charcoal)	= $ 3/cfm	RG, p. 36
(3) Charcoal filter equipment value, therefore	= $ 2/cfm	(1) - (2)
(4) Heater for charcoal @ $400/1000 cfm	=$0.40/cfm	RG, p. 41
(5) Building space assignment:		
(6) Prefilter-HEPA-charcoal: for 15000 cfm - 16' x 20' x 12' space = 3840 cu ft = 0.256 cu ft/cfm		RG, p. 41
(7) Prefilter-HEPA (w/o charcoal): for 15000 cfm 16' x 12' x 12' space = 2304 cu ft = 0.154 cu ft/cfm		RG, p. 36
(8) Bldg. space assignment for charcoal only, therefore, = 0.102 cu ft/cfm		(6) - (7)
(9) Bldg. space value: Auxiliary Bldg.	= $ 5/cfm	RG, p. 36
Turbine Bldg.	= $ 3/cfm	RG, p. 41

(10) CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. PROCESS EQUIPMENT

HEPA filter: 70,000 cfm @ $3/cfm = $210,000

2. BUILDING ASSIGNMENT

70,000 cfm @ 0.154 cu ft/cfm x $5/cu ft = $ 54,900

3. ASSOCIATED PIPING SYSTEMS

$10,000 allowance; allocate 50% to HEPA = 50% x $10,000 = $5000

4. INSTRUMENTS & CONTROLS

in base

ESTIMATED DIRECT COSTS--Detail Calculation Sheet continued:

5. ELECTRICAL SERVICE

in base

6. SPARE PARTS

$1000 allowance

Notes: (1) RG = Reg.Guide 1.110 dated 3/76; (2) Dollars = year 1975
(3) Labor/material percentages taken at Reg. Guide values.

Reactor St. Lucie 1

Designated System E-1

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove kidney from containment (20,000 cfm)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.7	
2. MAINTENANCE MATERIAL AND LABOR			12.0	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0.	
4. UTILITIES AND SERVICES				
Waste Disposal			2.0	
Water				
Steam				
Electricity			1.4	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			19.0	*

*Per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System E-1

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
HEPA/Charcoal Filters for Ventilation System
Detail Calculation Sheet

Description of Augment remove kidney from containment (20,000 cfm)

I. COST BASES per Reg Guide 1.110 dated 3/76 (p. 43 typical)

1. Operating Labor, Supervisory and Overhead
   - a) 7 1/2 minutes/shift for HEPA bank = 136 hours/year
   - b) 7 1/2 minutes/shift for charcoal bank = 136 hours/year
   - c) 40 hours HEPA bank annual test = 40 hours/year
   - Total = 312 hours/year

2. Maintenance Material and Labor
   - a) HEPA: one change every 2 years @ $150/ unit
   - b) prefilter: one change every 2 years @ $150 /unit
   - c) charcoal: one change every 2 years @ $ 900/ unit

3. Consumables, chemicals & supplies
   - a) Costs/year: $0

4. Utilities & Services
   - a) Waste disposal: 1) per HEPA unit: $50
     2) per prefilter unit: $50
     3) per charcoal unit: $100
   - b) Electricity : Additional fan HP for filter @ 0.5 kw/1000 cfm @ $0.018 /kwh = $80 year*/1000 cfm; allow pro-rata $60 /yr for HEPA, $ 20/yr for charcoal

---

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)*

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   312 hours/year @ $12 = $ 3,744 /yr

2. MAINTENANCE MATERIAL AND LABOR
   - 2a. 20 pref units x 0.5 unit/yr @ $150 ea = $ 1,500 /yr
   - 2b. 20 HEPA units x 0.5 unit/yr @ $150 ea = $ 1,500 /yr
   - 2c. 20 char units x 0.5 unit/yr @ $900 ea $ 9,000 /yr
   - Total $12,000 /yr

ESTIMATED ANNUAL OPERATING & MAINTENANCE COSTS HEPA continued:

3. CONSUMABLES, CHEMICALS & SUPPLIES = $ ______ yr.

4. UTILITIES & SERVICES

Waste Disposal

4a1.	20	pref units x 0.5 unit/yr @ $ 50 ea	= $	500 yr.
4a2.	20	HEPA units x 0.5 unit/yr @ $ 50 ea	= $	500 yr.
4a3.	20	char units x 0.5 unit/yr @ $100 ea	= $	1,000 yr.
		Total 4a	= $	2,000 yr.

Electricity

4d.	20	kcfm @ $ 80 /year/kcfm	= $	1,360 yr.

Notes: (1) HEPA unit = 1000 cfm unit; (2) Charcoal unit = 1000 cfm unit;
(3) Bank = entire group of filters for the total ventilation stream
(4) dollars = year 1975 (5) *continuous operation basis

Reactor St. Lucie 1 Designated System E-1

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove kidney from containment (20,000 cfm)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	14	126	140	
2. BUILDING ASSIGNMENT			–	
3. ASSOCIATED PIPING SYSTEMS	3	2	5	
4. INSTRUMENTATION & CONTROLS			–	
5. ELECTRICAL SERVICE			–	
6. SPARE PARTS		1	1	
SUBTOTAL	17	129	146	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	2	12	14	10%
8. TOTAL DIRECT COSTS	19	141	160	*

* per detail calculation sheet, next page.

Reactor. St. Lucie 1

Designated System E-1

ESTIMATED DIRECT COSTS--Detail Calculation Sheet
HEPA/Charcoal Filters For Ventilation Systems

Description of Augment remove kidney from containment (20,000 cfm)

		Cost Bases	Reference
(1)	Prefilter-HEPA-charcoal filter equipment	= \$ 5/cfm	RG, p. 41
(2)	Prefilter-HEPA-filter equipment only (w/o charcoal)	= \$ 3/cfm	RG, p. 36
(3)	Charcoal filter equipment value, therefore	= \$ 2/cfm	(1) - (2)
(4)	Heater for charcoal @ \$400/1000 cfm	=\$0.40/ cfm	RG, p. 41
(5)	Building space assignment:		
(6)	Prefilter-HEPA-charcoal: for 15000 cfm = 16' x 20' x 12' space = 3840 cu ft = 0.256 cu ft/cfm		RG, p. 41
(7)	Prefilter-HEPA (w/o charcoal): for 15000 cfm = 16' x 12' x 12' space = 2304 cu ft = 0.154 cu ft/cfm		RG, p. 36
(8)	Bldg. space assignment for charcoal only, therefore, = 0.102 cu ft/cfm		(6) - (7)
(9)	Bldg. space value: Auxillary Bldg.	= \$ 5 /cfm	RG, p. 36
	Turbine Bldg.	= \$ 3 /cfm	RG, p. 41

(10) CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. PROCESS EQUIPMENT

   allow \$7/cfm for HEPA & charcoal filter equipment plus blowers, mounts, ductwork and containment electrical & piping penetration
   20,000 cfm @ \$7/cfm = \$140,000

2. BUILDING ASSIGNMENT

   none required; equipment located in existing containment space.

3. ASSOCIATED PIPING SYSTEMS

   allow \$5000

4. INSTRUMENTS & CONTROLS

   in item 1

ESTIMATED DIRECT COSTS--Detail Calculation Sheet continued:

5. ELECTRICAL SERVICE

in item 1

6. SPARE PARTS

allow 1% x equipment = $1400

Notes: (1) RG = Reg.Guide 1.110 dated 3/76; (2) Dollars = year 1975
(3) Labor/material percentages taken at Reg. Guide values.

Reactor St. Lucie 1

Designated System E-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal to high volume purge (42,000 cfm)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.6	
2. MAINTENANCE MATERIAL AND LABOR			18.9	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0	
4. UTILITIES AND SERVICES				
Waste Disposal			2.1	
Water				
Steam				
Electricity			.8	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			23.4	continuous operation basis

Notes: *per detail calculation sheet, next page.
Since this purge system is operated at infrequent intervals, the annual O & M costs are taken at approximately 10% of continuous operation costs.

Reactor St. Lucie 1

Designated System E-2

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
HEPA/Charcoal Filters for Ventilation System
Detail Calculation Sheet

Description of Augment add charcoal to high vol purge (42,000 cfm)

I. COST BASES per Reg Guide 1.110 dated 3/76 (p. 43 typical)

1. Operating Labor, Supervisory and Overhead
   a) 7 1/2 minutes/shift for HEPA bank = hours/year
   b) 7 1/2 minutes/shift for charcoal bank = 136 hours/year
   c) 40 hours HEPA bank annual test = hours/year
   Total = 136 hours/year

2. Maintenance Material and Labor
   a) HEPA: one change every 2 years @ $150 unit
   b) prefilter: one change every 2 years @ $150 /unit
   c) charcoal: one change every 2 years @ $900 / unit

3. Consumables, chemicals & supplies

   a) Costs/year: $0

4. Utilities & Services
   a) Waste disposal: 1) per HEPA unit: $50
      2) per prefilter unit: $50
      3) per charcoal unit: $100
   b) Electricity : Additional fan HP for filter @ 0.5 kw/1000 cfm @ $ 0.018 /kwh = $ 80 year*/1000 cfm; allow pro-rata $ 60/yr for HEPA, $20 /yr for charcoal

---

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)*

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   136 hours/year @ $ 12 = $ 1,632 /yr

2. MAINTENANCE MATERIAL AND LABOR
   2a. X pref units x 0.5 unit/yr @ $ 150 ea = $ X /yr
   2b. X HEPA units x 0.5 unit/yr @ $150 ea = $ X
   2c. 42 char units x 0.5 unit/yr @ $900 ea = $ 18,900 /yr
   Total = $ 18,900 /yr

ESTIMATED ANNUAL OPERATING & MAINTENANCE COSTS HEPA continued:

3. CONSUMABLES, CHEMICALS & SUPPLIES = $ 0 yr.

4. UTILITIES & SERVICES

Waste Disposal

4a1.	X	pref units x 0.5 unit/yr @ $ 50 ea	= $ X /yr.
4a2.	X	HEPA units x 0.5 unit/yr @ $ 50 ea	= $ X /yr.
4a3.	42	char units x 0.5 unit/yr @ $100 ea	= $ 2,100 /yr.
		Total 4a	= $ 2,100 /yr.

Electricity

4d.	42	kcfm @ $ 20 /year/kcfm	= $ 840 /yr.

Notes: (1) HEPA unit = 1000 cfm unit; (2) Charcoal unit = 1000 cfm unit;
(3) Bank = entire group of filters for the total ventilation stream
(4) dollars = year 1975 (5) *continuous operation basis

Reactor St. Lucie 1 | Designated System E-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal to high vol purge (42,000 cfm)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	10	91	101	
2. BUILDING ASSIGNMENT	14	7	21	
3. ASSOCIATED PIPING SYSTEMS	3	1	4	
4. INSTRUMENTATION & CONTROLS			–	
5. ELECTRICAL SERVICE	8	4	12	
6. SPARE PARTS		5	5	
SUBTOTAL	35	108	143	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	3	11	14	10%
8. TOTAL DIRECT COSTS	38	129	157	*

*per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System E-2 6

ESTIMATED DIRECT COSTS—Detail Calculation Sheet
HEPA/Charcoal Filters For Ventilation Systems

Description of Augment add charcoal to high vol purge (42,000 cfm)

		Cost Bases	Reference
(1)	Prefilter-HEPA-charcoal filter equipment	= $5 /cfm	RG, p. 41
(2)	Prefilter-HEPA-filter equipment only (w/o charcoal)	= $3 /cfm	RG, p. 36
(3)	Charcoal filter equipment value, therefore	= $2 /cfm	(1) - (2)
(4)	Heater for charcoal @ $400/1000 cfm	= $0.40/cfm	RG, p. 41
(5)	Building space assignment:		
(6)	Prefilter-HEPA-charcoal: for 15000 cfm = 16' x 20' x 12' space = 3840 cu ft = 0.256 cu ft/cfm		RG, p. 41
(7)	Prefilter-HEPA (w/o charcoal): for 15000 cfm 16' x 12' x 12' space = 2304 cu ft = 0.154 cu ft/cfm		RG, p. 36
(8)	Bldg. space assignment for charcoal only, therefore, = 0.102 cu ft/cfm		(6) - (7)
(9)	Bldg. space value: Auxiliary Bldg.	= $5 /cfm	RG, p. 36
	Turbine Bldg.	= $3 /cfm	RG, p. 41

(10) CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. PROCESS EQUIPMENT
   charcoal filter: 42,000 cfm @ $2/cfm = $ 84,000
   heater for charcoal: 42,000 cfm @ $0.40/cfm 16,800
   $ 100,800
2. BUILDING ASSIGNMENT

   42,000 cfm x 0.102 cu ft/cfm @$5/cu ft = $21,420
3. ASSOCIATED PIPING SYSTEMS

   $8000 allowance; allocate 50% to charcoal = $4000
4. INSTRUMENTS & CONTROLS

   in item 1

ESTIMATED DIRECT COSTS--Detail Calculation Sheet continued:

5. ELECTRICAL SERVICE

allowance = $10,000 plus 25% for size increase = $12,500

6. SPARE PARTS

allowance = $5000

Notes: (1) RG = Reg.Guide 1.110,dated 3/76; (2) Dollars = year 1975
(3) Labor/material percentages taken at Reg. Guide values.

Reactor St. Lucie 1

Designated System E-3

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove HEPA from high vol purge (42,000 cfm)

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			2.1	
2. MAINTENANCE MATERIAL AND LABOR			6.3	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0	
4. UTILITIES AND SERVICES				
Waste Disposal			2.1	
Water				
Steam			2.5	
Electricity				
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			13.0*	continuous operation basis

*per detail calculation sheet, next page.
Since this purge system is operated at infrequent intervals, the annual O & M costs are taken at approximately 10% of continuous operation costs.

Reactor St. Lucie 1

Designated System E-3

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
HEPA/Charcoal Filters for Ventilation System
Detail Calculation Sheet

Description of Augment remove HEPA from high vol purge (42,000 cfm)

I. COST BASES per Reg Guide 1.110 dated 3/76 (p. 43 typical)

1. Operating Labor, Supervisory and Overhead
   a) 7 1/2 minutes/shift for HEPA bank = 136 hours/year
   b) 7 1/2 minutes/shift for charcoal bank =
   c) 40 hours HEPA bank annual test = 40 hours/year
   Total = 176 hours/year

2. Maintenance Material and Labor
   a) HEPA: one change every 2 years @ $150/ unit
   b) prefilter: one change every 2 years @ $150 /unit
   c) charcoal: one change every 2 years @ $900 / unit

3. Consumables, chemicals & supplies

   a) Costs/year: $0

4. Utilities & Services
   a) Waste disposal: 1) per HEPA unit: $50
   2) per prefilter unit: $50
   3) per charcoal unit: $100
   b) Electricity : Additional fan HP for filter @ 0.5 kw/1000 cfm @ $0.018 /kwh = $80 year*/1000 cfm; allow pro-rata $60/yr for HEPA, $20/yr for charcoal

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)*

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   176 hours/year @ $ = $ 2,112 /yr

2. MAINTENANCE MATERIAL AND LABOR
   2a. 42 pref units x 0.5 unit/yr @ $150 ea = $ 3,150 /yr
   2b. 42 HEPA units x 0.5 unit/yr @ $150 ea = $ 3,150
   2c. X char units x 0.5 unit/yr @ $900 ea X /yr

   Total $ 6,300 /yr

ESTIMATED ANNUAL OPERATING & MAINTENANCE COSTS HEPA continued:

3. CONSUMABLES, CHEMICALS & SUPPLIES = $ ______ yr.

4. UTILITIES & SERVICES

Waste Disposal

4a1.	42	pref units x 0.5 unit/yr @ $ 50 ea	= $ 1,050/ yr.
4a2.	42	HEPA units x 0.5 unit/yr @ $ 50 ea	= $ 1,050/ yr.
4a3.	X	char units x 0.5 unit/yr @ $100 ea	= $ X yr.
		Total 4a	= $ 2,100/ yr.

Electricity

4d.	42	kcfm @ $ 60 /year/kcfm	= $ 2,520/ yr.

Notes: (1) HEPA unit = 1000 cfm unit; (2) Charcoal unit = 1000 cfm unit;
(3) Bank = entire group of filters for the total ventilation stream
(4) dollars = year 1975 (5) *continuous operation basis

Reactor St. Lucie 1 Designated System E-3

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove HEPA from high vol purge (42,000 cfm)

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	12	114	126	
2. BUILDING ASSIGNMENT	21	11	32	
3. ASSOCIATED PIPING SYSTEMS	3	1	4	
4. INSTRUMENTATION & CONTROLS			-	
5. ELECTRICAL SERVICE			-	
6. SPARE PARTS		1	1	
SUBTOTAL	36	127	163	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	3	13	16	
8. TOTAL DIRECT COSTS	39	140	179	*

*per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System E-3 6

ESTIMATED DIRECT COSTS--Detail Calculation Sheet
HEPA/Charcoal Filters For Ventilation Systems

Description of Augment

		Cost Bases	Reference
(1)	Prefilter-HEPA-charcoal filter equipment	= $ 5/cfm	RG, p. 41
(2)	Prefilter-HEPA-filter equipment only (w/o charcoal)	= $ 3/cfm	RG, p. 36
(3)	Charcoal filter equipment value, therefore	= $ 2/cfm	(1) - (2)
(4)	Heater for charcoal @ $400/1000 cfm	=$0.40/cfm	RG, p. 41
(5)	Building space assignment:		
	(6) Prefilter-HEPA-charcoal: for 15000 cfm = 16' x 20' x 12' space = 3840 cu ft = 0.256 cu ft/cfm		RG, p. 41
	(7) Prefilter-HEPA (w/o charcoal): for 15000 cfm 16' x 12' x 12' space = 2304 cu ft = 0.154 cu ft/cfm		RG, p. 36
	(8) Bldg. space assignment for charcoal only, therefore, = 0.102 cu ft/cfm		(6) - (7)
(9)	Bldg. space value: Auxillary Bldg.	= $ 5/cfm	RG, p. 36
	Turbine Bldg.	= $ 3/cfm	RG, p. 41

(10) CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. PROCESS EQUIPMENT

   42,000 cfm @ $3 cfm = $126,000

2. BUILDING ASSIGNMENT

   42,000 cfm x 0.154 cu ft/cfm @$5/cu ft = $32,340

3. ASSOCIATED PIPING SYSTEMS

   $8000 allowance; assign 50% to HEPA = $4000

4. INSTRUMENTS & CONTROLS

   in item 1

ESTIMATED DIRECT COSTS--Detail Calculation Sheet continued:

5. ELECTRICAL SERVICE

in base

6. SPARE PARTS

allow 1% x equipment = $1260

Notes: (1) RG = Reg.Guide 1.110,dated 3/76; (2) Dollars = year 1975
(3) Labor/material percentages taken at Reg. Guide values.

Reactor St. Lucie 1

Designated System F-1

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal filter to condenser air ejector

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.8	15 min/shift + 40 hr annual test
2. MAINTENANCE MATERIAL AND LABOR			2.0	includes replacement filter
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0	in item 2
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			neg	

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			5.8	*

*per RG.1.110 values, p. 54.

Reactor St. Lucie 1 Designated System F-1

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add charcoal filter to condenser air ejector

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	3.0	7.5	10.5	chiller, heater, charcoal HEPA
2. BUILDING ASSIGNMENT	3.0	1.5	4.5	
3. ASSOCIATED PIPING SYSTEMS	2.0	1.0	3.0	allowance
4. INSTRUMENTATION & CONTROLS	0.5	1.5	2.0	allowance
5. ELECTRICAL SERVICE	0.5	0.5	1.0	allowance
6. SPARE PARTS	-	1.0	1.0	
SUBTOTAL	9.0	13.0	22.0	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	1.0	1.0	2.0	10%
8. TOTAL DIRECT COSTS	10.0	14.0	24.0	*

*per RG 1.110 values, p. 53.

PART II. ALTERNATE LIQUID TREATMENT SYSTEMS

The alternate liquid treatment systems have also been designated and described in a manner similar to that used for the gaseous waste systems. Our cost-benefit analyses considered these systems:

System Designation	Component of System Affected	Description of Change
G-1	Steam Generator Blowdown Treatment	Remove cation bed
G-2	Steam Generator Blowdown Treatment	Remove mixed bed
G-3	Steam Generator Blowdown Treatment	Discard SGB without treatment
H-2	Clean Waste System	Remove evaporator
H-3	Clean Waste System	Remove demineralizer
H-4	Clean Waste System	Increase tankage
H-5	Clean Waste System	Remove evaporator and increase tankage
J-2	Dirty Waste System	Remove evaporator
J-3	Dirty Waste System	Remove demineralizer
J-4	Dirty Waste System	Increase tankage
J-5	Dirty Waste System	Remove evaporator and increase tankage
I	Laundry Waste System	Add reverse osmosis for detergents

Our calculations of the Operating and Maintenance Costs and Total Direct Cost Estimates for each of these alternative systems are given on pages 64 to 104.

Reactor St. Lucie 1 Designated System G-1

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove cation demineralizer from steam generator blowdown

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.3	15 min/shift
2. MAINTENANCE MATERIAL AND LABOR			5.0	allowance
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			11.2	150 ft^3 resin/yr @ \$75/ft^3
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			3.0	150 ft^3yr @ \$20/ft^3 disposal cost

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			22.5	*

* per RG 1.110 values, p. 75.

Reactor St. Lucie 1 Designated System G-1

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove cation demineralizers from SG blowdown treatment

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	20	180	200	SS, ASME VIII, 150 psi, nonregenerative, with resin
2. BUILDING ASSIGNMENT	65	35	100	
3. ASSOCIATED PIPING SYSTEMS	60	30	90	
4. INSTRUMENTATION & CONTROLS	4	6.0	10.0	allowance
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS	–	10	10	miscellaneous supplies
SUBTOTAL	149	261	410	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	14	26	40	
8. TOTAL DIRECT COSTS	163	287	450	*

*approximate Reg. Guide values with adjustments for retrofit installation at St. Lucie 1 & 2.

Reactor St. Lucie 1

Designated System G-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove mixed-bed demineralizer from steam generator blowdown

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.3	15 min/shift
2. MAINTENANCE MATERIAL AND LABOR			5.0	allowance
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			18.7	250 ft^3 resin/yr @ $75/$ft^3$
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			5.0	250 ft^3/yr @ $20/$ft^3$ disposal cost

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			32.0	*

*per RG 1.110 values, p. 75.

Reactor St. Lucie 1 Designated System G-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove mixed-bed demineralizer from steam generator blowdown

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	20	180	200	SS, ASME VIII, 150 psi, nonregenerative, with resin
2. BUILDING ASSIGNMENT	65	35	100	
3. ASSOCIATED PIPING SYSTEMS	60	30	90	
4. INSTRUMENTATION & CONTROLS	4	6.0	10.0	allowance
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS	-	10	10	
SUBTOTAL	149	261	410	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	14	26	40	
8. TOTAL DIRECT COSTS	163	287	450	*

*approximate Reg. Guide values with adjustments for retrofit installation at St. Lucie 1 & 2.

Reactor St. Lucie 1

Designated System G-3

COMBINATION OF AUGMENTS
Detail Calculation Sheet

Description of Augment: discard steam generator blowdown without treatment

	ANNUAL COSTS			
	Capital Cost Fixed Charge @	Operating	Maint.	Total Annual Cost
G-1 remove cation bed	(128.8)	(17.5)	(5.0)	(151.3)
G-2 remove mixed bed	(214.5)	(27.0)	(5.0)	(246.5)
G-3 total change	(343.3)	(44.5)	(10.0)	(397.8)

NOTES: (1) This case is an algebraic combination of the costs of cases G-1 and G-2.

(2) The capital costs of these cases are as previously shown on the individual calculation sheets for these cases.

(3) Dollars = year 1975

( ) = saving for combination cases

Reactor St. Lucie 1

Designated System H-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove evaporator from clean waste system

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.5	291×10^3 gpy
2. MAINTENANCE MATERIAL AND LABOR			34.1	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES				
4. UTILITIES AND SERVICES				
Waste Disposal			7.8	
Water			5.2	
Steam			8.7	
Electricity			neg	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			59.3	*

*per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System H-3

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove demineralizer from clean waste system

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.3	clean waste, 291 x 10^3 gpy
2. MAINTENANCE MATERIAL AND LABOR			1.4	allowance (clean waste)
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			1.6	1 change per yr @ \$75/ft^3 x clean waste assignment
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			0.4	30 ft^3 @ \$20/ft^3 disposal cost x clean waste assignment

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			4.7	*

*Cost bases per RG 1.110, p. 65.

Reactor St. Lucie 1

Designated System H-2

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
EVAPORATOR SYSTEMS
Detail Calculation Sheet

Description of Augment remove evaporator from clean waste system

I. COST BASES (Typical values per Reg. Guide 1.110 dated 3/76, pp.60-63)

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   a) clean waste volume: 940 gpd x 310 days/yr = 291,000 gpy
   b) Use 1 hr. labor per 1000 gal. waste handled (approx. Reg. Guide basis).

2. MAINTENANCE MATERIAL AND LABOR
   a) Use 7 1/2% of estimated equipment cost.

3. CONSUMABLES, CHEMICALS & SUPPLIES
   a) Costs/year: $0

4. UTILITIES & SERVICES
   a) Waste disposal: 1) clean waste; use 100:1 feed/conc ratio (per RG)
      2) dirty waste; use 50:1 feed/conc ratio (per RG)
      3) disposal cost = $20/ft^3 concentrate (per RG)
   b) Water: 1) Use 4 gal. cooling water per lb. steam used (= about 30 F rise)
      2) Use water cost = $0.30/1000 gal. (per RG)
   c) Steam: 1) Use 10 lb. steam per gal. waste processed x 1.5 for heat losses, start-up, idling time allowances, etc.
      2) Use steam cost @ $2/10^3 lbs. (per RG)

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   a) Operating labor hours: 291 hours @ $12/hr = $ 3,492 /yr.

2. MAINTENANCE MATERIAL AND LABOR
   a) 7 1/2 % x $650,000 x clean waste = $ 34,125 /yr.

3. CONSUMABLES, CHEMICALS & SUPPLIES[b]

4. UTILITIES & SERVICES
   a) Waste generated @ 100:1 ratio = 2910 gal/yr ÷ 7.5 = 388 ft^3/yr
   @ \$20/ft^3 disposal = \$7760/yr
   b) Cooling water @ 4 gal/lb of steam used = 4 x 4365 x 10^3 lb steam/yr = 17460 x 10^3 gal/yr @ 30 cents/10^3 gal = \$5,238/yr
   c) Steam = 10 x 1.5 x 291 x 10^3 gal waste/yr = 4365 x 10^3 lb steam/yr @ \$2/10^3 lb = \$8,730 /yr

III. NOTES

Concentrate solidification chemicals are in item 4.
Dollars = year 1975.
Clean waste is approximately 70% of total waste.
RG = Reg. Guide 1.110, dated 3/76.

Reactor St. Lucie 1 Designated System H-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment Remove evaporator from clean waste system

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	30	254	284	20 gpm evaporator
2. BUILDING ASSIGNMENT	74	38	112	
3. ASSOCIATED PIPING SYSTEMS	36	35	71	
4. INSTRUMENTATION & CONTROLS	12	12	24	
5. ELECTRICAL SERVICE	43	27	70	
6. SPARE PARTS		30	30	
SUBTOTAL	195	396	591	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	20	39	59	
8. TOTAL DIRECT COSTS	215	435	650	*

*Bases per graphical data on next page; same approximate labor/equipment/support/facility distribution as Reg. Guide.

Reactor St. Lucie 1 | Designated System H-3

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove demineralizer from clean waste system

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	4.0	20.0	24.0	30 ft^3, SS, ASME VIII, 150 psi nonregenerative, w/resin
2. BUILDING ASSIGNMENT	6.4	3.2	9.6	
3. ASSOCIATED PIPING SYSTEMS	9.0	6.0	15.0	2" piping
4. INSTRUMENTATION & CONTROLS	2.0	3.0	5.0	remote conductivity readout
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS	–	1.0	1.0	
SUBTOTAL	21.4	33.2	54.6	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	2.0	3.4	5.4	10%
8. TOTAL DIRECT COSTS	23.4	36.6	60	*

*Cost Bases per RG 1.110, p. 64.

Reactor St. Lucie 1 Designated System H-4

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment increase no. of equipment drain collection tanks in clean waste system

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.1	5 min/shift - log level readings
2. MAINTENANCE MATERIAL AND LABOR			1.6	allowance
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			neg	
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			neg	

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			2.7	*

*Cost bases per RG 1.110 p. 84 (one tank added for case H-4)

Reactor . St. Lucie 1

Designated System H-4

Description of Augment increase no. of equipment drain collection tanks in clean waste system

TOTAL DIRECT COST ESTIMATE SHEET
Detail Calculation Sheet

Item	Direct Installed Costs*	
Install two 25,000 gallon collection tanks	Two 25,000-gal tanks @ $170,000 each	= $340,000
Delete one 40,000 gallon collection tank	One 40,000-gal tank @ $225,000	= $225,000
Net change (= case H-4)		+ $115,000

*per graphical data given on next page.

Reactor St. Lucie 1

Designated System H-5

COMBINATION OF AUGMENTS
Detail Calculation Sheet

Description of Augment: Increase no. of equipment drain collection tanks and remove evaporator from clean waste system

	ANNUAL COSTS			
	Capital Cost Fixed Charge @ 16.35%	Operating	Maint.	Total Annual Cost
H-2 remove evaporator	(185.9)	(25.2)	(34.1)	(245.2)
H-4 add tanks	32.8	1.1	1.6	35.5
net change (= Case H-5)	(153.1)	(24.1)	(32.5)	(209.7)

NOTES:
(1) This case is an algebraic combination of the costs of cases H-2 and H-4.
(2) The capital costs of these cases are as previously shown on the individual calculation sheets for these cases.
(3) Dollars = year 1975
( ) = saving for combination cases.

Reactor St. Lucie 1 Designated System I

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add reverse osmosis to detergent wastes

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			3.1	1300 hrs/yr @ 20% attendance
2. MAINTENANCE MATERIAL AND LABOR			8.8	4% less bldg + 24 module with 3-yr life @ $600 each
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			neg	
4. UTILITIES AND SERVICES				
Waste Disposal			4.3	100:1 vol reduction @ $20/ft^3 disposal cost
Water				
Steam				
Electricity			neg	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			16.2	*

*Cost bases per RG 1.110, p. 82.

Reactor St. Lucie 1 Designated System I

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment add reverse osmosis to detergent wastes

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	6.0	60.0	66.0	skid mounted w/500 - gal SS feed tank, ASME VIII
2. BUILDING ASSIGNMENT	19.2	9.6	28.8	
3. ASSOCIATED PIPING SYSTEMS	3.0	2.0	5.0	allowance
4. INSTRUMENTATION & CONTROLS			-	in item 1
5. ELECTRICAL SERVICE	7.0	13.0	20.0	allowance
6. SPARE PARTS	-	6.0	6.0	
SUBTOTAL	35.2	90.6	125.8	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	3.0	9.2	12.2	10%
8. TOTAL DIRECT COSTS	38.2	99.8	138	*

*Cost bases per RG 1.110, p. 81.

Reactor St. Lucie 1 | Designated System J-2

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove evaporator from dirty waste system

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.6	dirty waste 135 x 10^3 gpy
2. MAINTENANCE MATERIAL AND LABOR			14.6	
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0	
4. UTILITIES AND SERVICES				
Waste Disposal			7.2	
Water			2.4	
Steam			4.0	
Electricity			neg	
Building Services				
Other				

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			29.8	*

*per detail calculation sheet, next page.

Reactor St. Lucie 1

Designated System J-2

ESTIMATED ANNUAL OPERATING AND MAINTENANCE COSTS
EVAPORATOR SYSTEMS
Detail Calculation Sheet

Description of Augment remove evaporator from dirty waste system

I. COST BASES (Typical values per Reg. Guide 1.110 dated 3/76, pp.60-63)

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   a) dirty waste volume: 435 gpd x 310 days/yr = 134,850 gpy
   b) Use 1 hr. labor per 1000 gal. waste handled (approx. Reg. Guide basis).

2. MAINTENANCE MATERIAL AND LABOR
   a) Use 7 1/2% of estimated equipment cost.

3. CONSUMABLES, CHEMICALS & SUPPLIES
   a) Costs/year: $0

4. UTILITIES & SERVICES
   a) Waste disposal: 1) clean waste; use 100:1 feed/conc ratio (per RG)
      2) dirty waste; use 50:1 feed/conc ratio (per RG)
      3) disposal cost = $20/ft^3 concentrate (per RG)
   b) Water: 1) Use 4 gal. cooling water per lb. steam used (= about 30 F rise)
      2) Use water cost = $0.30/1000 gal. (per RG)
   c) Steam: 1) Use 10 lb. steam per gal. waste processed x 1.5 for heat losses, start-up, idling time allowances, etc.
      2) Use steam cost @ $2/10^3 lbs. (per RG)

II. CALCULATIONS FOR ESTIMATE SHEET (per above bases)

1. OPERATING LABOR, SUPERVISORY AND OVERHEAD
   a) Operating labor hours: 135 hours @ $12/hr = $ 1,620 /yr.

2. MAINTENANCE MATERIAL AND LABOR
   a) 7 1/2 % x $650,000 x dirty waste = $ 14,625 /yr.

3. CONSUMABLES, CHEMICALS & SUPPLIES[b]

4. UTILITIES & SERVICES

a) Waste generated @ 50:1 ratio = 2700 gal/yr ÷ 7.5 = 360 ft^3/yr

@ $20/$ft^3$ disposal = $7200/yr

b) Cooling water @ 4 gal/lb of steam used = 4 x 2025 x 10^3 lb steam/yr = 8100 x 10^3 gal/yr @ 30 cents/10^3 gal = $ 2,430/yr

c) Steam = 10 x 1.5 x 135 x 10^3 gal waste/yr = 2025 x 10^3 lb steam/yr @ $2/$10^3$ lb = $ 4050 /yr

III. NOTES

Concentrate solidification chemicals are in item 4.
Dollars = year 1975.
Dirty waste is approximately 30% of total waste.
RG = Reg. Guide 1.110, dated 3/76.

Reactor St. Lucie 1 Designated System J-2

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment remove evaporator from dirty waste system

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	30	254	284	20 gpm evaporator
2. BUILDING ASSIGNMENT	74	38	112	
3. ASSOCIATED PIPING SYSTEMS	36	35	71	
4. INSTRUMENTATION & CONTROLS	12	12	24	
5. ELECTRICAL SERVICE	43	27	70	
6. SPARE PARTS		30	30	
SUBTOTAL	195	396	591	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	20	39	59	
8. TOTAL DIRECT COSTS	215	435	650	*

*Bases per graphical data next page; same approximate labor/equipment/support-facility distribution as RG 1.110.

Reactor St. Lucie 1 Designated System J-3

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment Remove demineralizer from dirty waste system

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			0.5	dirty waste 135×10^3 gpy
2. MAINTENANCE MATERIAL AND LABOR			0.6	allowance (dirty waste)
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			0.7	1 change per yr @$75/ft^3 x dirty waste assignment
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			0.2	30 ft^3 @ $20/ft^3 disposal cost x dirty waste assignment

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			2.0	*

* Cost bases per RG 1.110, p. 65.

Reactor St. Lucie 1 Designated System J-3

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment Remove demineralizer from dirty waste system

DIRECT COST (1975 $1000)

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
1. PROCESS EQUIPMENT	4.0	20.0	24.0	30 ft^3, SS, ASME VIII, 150 psi nonregenerative, w/resin
2. BUILDING ASSIGNMENT	6.4	3.2	9.6	
3. ASSOCIATED PIPING SYSTEMS	9.0	6.0	15.0	2" piping
4. INSTRUMENTATION & CONTROLS	2.0	3.0	5.0	remote conductivity readout
5. ELECTRICAL SERVICE			neg	
6. SPARE PARTS	-	1.0	1.0	
SUBTOTAL	21.4	33.2	54.6	

TOTAL DIRECT COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM continued:

ITEM	LABOR	EQUIPMENT/MATERIALS	TOTAL	BASIS FOR COST ESTIMATE
7. CONTINGENCY	2.0	3.4	5.4	10%
8. TOTAL DIRECT COSTS	23.4	36.6	60.0	*

*Cost bases per RG 1.110, p. 64.

Reactor St. Lucie 1

Designated System J-4

ANNUAL OPERATING AND MAINTENANCE COST ESTIMATE SHEET OF RADWASTE TREATMENT SYSTEM FOR LIGHT-WATER-COOLED NUCLEAR REACTORS

Description of Augment Increase no. of dirty waste collection tanks

COST (1975 $1000)

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
1. OPERATING LABOR, SUPERVISION, AND OVERHEAD			1.1	5 min/shift-log level readings
2. MAINTENANCE MATERIAL AND LABOR			1.6	allowance
3. CONSUMABLES, CHEMICALS, AND SUPPLIES			neg	
4. UTILITIES AND SERVICES Waste Disposal Water Steam Electricity Building Services Other			neg	

ANNUAL OPERATING & MAINTENANCE COST ESTIMATE SHEET continued:

ITEM	LABOR	OTHER	TOTAL	BASIS FOR COST ESTIMATE
5. TOTAL O AND M ANNUAL COST			2.7	*

*Cost bases per RG 1.110, p. 84 (one tank added for case J-4).

Reactor St. Lucie 1

Designated System J-4

Description of Augment increase no. of dirty waste collection tanks

TOTAL DIRECT COST ESTIMATE SHEET
Detail Calculation Sheet

Item	Direct Installed Costs*
Install two 12,500 gallon tanks	Two 12,500 gallon tanks @ $110,000 each = $220,000
Delete one 1,000 gallon tank	One 1,000 gallon tank @ $24,000 each = - 24,000
Net change	+$196,000

*per graphical data next page.

Reactor St. Lucie 1

Designated System J-5

COMBINATION OF AUGMENTS
Detail Calculation Sheet

Description of Augment: Increase no. of collection tanks and remove evaporator from dirty waste system.

	ANNUAL COSTS			
	Capital Cost Fixed Charge @ 16.35%	Operating	Maint.	Total Annual Cost
J-2 remove evaporator	(185.9)	(15.2)	(14.6)	(215.7)
J-4 add tanks	56.1	1.1	1.6	58.8
Net change	(129.8)	(14.1)	(13.0)	(156.9)

NOTES: (1) This case is an algebraic combination of the costs of cases J2 and J4.
(2) The capital costs of these cases are as previously shown on the individual calculation sheets for these cases.
(3) Dollars = year 1975
( ) = saving for combination cases

FLORIDA POWER & LIGHT COMPANY

March 15, 1976

ATTACHMENT A

Dr. Walton A. Rodger
Nuclear Safety Associates
5101 River Road
Bethesda, MD 20016

Dear Walt:

Shelton Stanton has requested that we provide the fixed charge rate which FPL is using for its St. Lucie 2 and South Dade nuclear plants. Mr. Roger DeVore of our Finance Department advises me that the most recently computed (January 76) charge rate for its nuclear plants (both St. Lucie and South Dade) is 16.35% per year. This is the preferred number for determining levelized costs as opposed to the Capital Recovery Factor used in NRC Regulatory Guide 4.2.

Yours truly,

Larry

Larry Leskvojan

LLL:nch