PROPOSED TECHNICAL SPECIFICATIONS FOR
ST. LUCIE PLANT, UNIT NO. 1
Docket Number 50-335

2.4 LIMITING CONDITIONS FOR OPERATION

Radioactive Effluents

Objective: To define the limits and conditions for the controlled release of radioactive materials in liquid and gaseous effluents to the environs to ensure that these releases are as low as practicable. These releases should not result in radiation exposures in unrestricted areas greater than a few percent of natural background exposures. The concentrations of radioactive materials in effluents shall be within the limits specified in 10 CFR Part 20.

To ensure that the releases of radioactive material above background to unrestricted areas be as low as practicable as defined in Appendix I to 10 CFR Part 50, the following design objectives apply:

For liquid wastes:

a. The annual dose above background to the total body or any organ of an individual from all reactors at a site should not exceed 5 mrem in an unrestricted area.

b. The annual total quantity of radioactive materials in liquid waste, excluding tritium and dissolved gases, discharged from each reactor should not exceed 5 Ci.

For gaseous wastes:

c. The annual total quantity of noble gases above background discharged from the site should result in an air dose due to gamma radiation of less than 10 mrad, and an air dose due to beta radiation of less than 20 mrad, at any location near ground level which could be occupied by individuals at or beyond the boundary of the site.

d. The annual total quantity of all radioiodines and radioactive material in particulate forms with half-lives greater than eight days, above background, from all reactors at a site should not result in an annual dose to any organ of an individual in an unrestricted area from all pathways of exposure in excess of 15 mrem.

e. The annual total quantity of iodine-131 discharged from each reactor at a site should not exceed 1 Ci.

2.4.1 Specifications for Liquid Waste Effluents

a. The concentration of radioactive materials released in liquid waste effluents from all reactors at the site shall not exceed the values specified in 10 CFR Part 20, Appendix B, Table II, Column 2, for unrestricted areas.

b. The cumulative release of radioactive materials in liquid waste effluents, excluding tritium and dissolved gases, shall not exceed 10 Ci/reactor/calendar quarter.

c. The cumulative release of radioactive materials in liquid waste effluents, excluding tritium and dissolved gases, shall not exceed 20 Ci/reactor in any 12 consecutive months.

d. During release of radioactive wastes, the effluent control monitor shall be set to alarm and to initiate the automatic closure of each waste isolation valve prior to exceeding the limits specified in 2.4.1.a above.

e. The operability of each automatic isolation valve in the liquid radwaste discharge lines shall be demonstrated quarterly.

f. The equipment installed in the liquid radioactive waste system shall be maintained and shall be operated to process radioactive liquid wastes prior to their discharge when the projected cumulative release could exceed 1.25 Ci/reactor/calendar quarter, excluding tritium and dissolved gases.

g. The maximum radioactivity to be contained in any liquid radwaste tank that can be discharged directly to the environs shall not exceed 10 Ci, excluding tritium and dissolved gases.

h. If the cumulative release of radioactive materials in liquid effluents, excluding tritium and dissolved gases, exceeds 2.5 Ci/reactor/calendar quarter, the licensee shall made an investigation to identify the causes for such releases, define and initiate a program of action to reduce such releases to the design objective levels listed in Section 2.4, and report these actions to the NRC in accordance with Specification 5.6.2.c(1).

i. An unplanned or uncontrolled offsite release of radioactive materials in liquid effluents in excess of 0.5 curies requires notification. This notification shall be in accordance with Specification 5.6.2.c(3).

2.4.2 Specifications for Liquid Waste Sampling and Monitoring

a. Plant records shall be maintained of the radioactive concentration and volume before dilution of liquid waste intended for discharge and the average dilution flow and length of time over which each discharge occurred. Sample analysis results and other reports shall be submitted as required by Section 5.6.1 of these Specifications. Estimates of the sampling and analytical errors associated with each reported value shall be included.

b. Prior to release of each batch of liquid waste, a sample shall be taken from that batch and analyzed for the concentration of each significant gamma energy peak in accordance with Table 2.4-1 to demonstrate compliance with Specification 2.4.1 using the flow rate into which the waste is discharged during the period of discharge.

c. Sampling and analysis of liquid radioactive waste shall be performed in accordance with Table 2.4-1. Prior to taking samples from a monitoring tank, at least two tank volumes shall be recirculated.

d. The radioactivity in liquid wastes shall be continuously monitored and recorded during release. Whenever these monitors are inoperable for a period not to exceed 72 hours, two independent samples of each tank to be discharged shall be analyzed and two

plant personnel shall independently check valving prior to the discharge. If these monitors are inoperable for a period exceeding 72 hours, no release from a liquid waste tank shall be made and any release in progress shall be terminated.

e. The flow rate of liquid radioactive waste shall be continuously measured and recorded during release.

f. All liquid effluent radiation monitors shall be calibrated at least quarterly by means of a radioactive source which has been calibrated to a National Bureau of Standards source. Each monitor shall also have a functional test monthly and an instrument check prior to making a release.

g. The radioactivity in steam generator blowdown shall be continuously monitored and recorded. Whenever these monitors are inoperable, the blowdown flow shall be diverted to the waste management system and the direct release to the environment terminated.

Bases: The release of radioactive materials in liquid waste effluents to unrestricted areas shall not exceed the concentration limits specified in 10 CFR Part 20 and should be as low as practicable in accordance with the requirements of 10 CFR Part 50.36a. These specifications provide reasonable assurance that the resulting annual dose to the total body or any organ of an individual in an unrestricted area will not exceed 5 mrem. At the same time, these specifications permit the flexibility of operation, compatible with considerations of health and safety, to assure that the public

is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. It is expected that by using this operational flexibility under unusual operating conditions, and exerting every effort to keep levels of radioactive material in liquid wastes as low as practicable, the annual releases will not exceed a small fraction of the concentration limits specified in 10 CFR Part 20.

The design objectives have been developed based on operating experience taking into account a combination of variables including defective fuel, primary system leakage, primary to secondary system leakage, steam generator blowdown and the performance of the various waste treatment systems, and are consistent with Appendix I to 10 CFR Part 50.

Specification 2.4.1.a requires the licensee to limit the concentration of radioactive materials in liquid waste effluents released from the site to levels specified in 10 CFR Part 20, Appendix B, Table II, Column 2, for unrestricted areas. This specification provides assurance that no member of the general public will be exposed to liquid containing radioactive materials in excess of limits considered permissible under the Commission's Regulations.

Specifications 2.4.1.b and 2.4.1.c establish the upper limits for the release of radioactive materials in liquid effluents. The intent of these Specifications is to permit the licensee the flexibility of operation to assure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the levels normally achievable when the plant and the liquid waste treatment systems are functioning as designed. Releases of up to these levels will result in concentrations of radioactive material in liquid waste effluents at small percentages of the limits specified in 10 CFR Part 20.

Consistent with the requirements of 10 CFR Part 50, Appendix A, Design Criterion 64, Specifications 2.4.1.d and 2.4.1.e require operation of suitable equipment to control and monitor the releases of radioactive materials in liquid wastes during any period that these releases are taking place.

Specification 2.4.1.f requires that the licensee maintain and operate the equipment installed in the liquid waste systems to reduce the release of radioactive materials in liquid effluents to as low as practicable consistent with the requirements of 10 CFR Part 50.36a. Normal use and maintenance of installed equipment in the liquid waste system provides reasonable assurance that the quantity released will not exceed the design objective. In order to keep releases of radioactive

materials as low as practicable, the specification requires operation of equipment whenever it appears that the projected cumulative discharge rate will exceed one-fourth of this design objective annual quantity during any calendar quarter.

Specification 2.4.1.g restricts the amount of radioactive material that could be inadvertently released to the environment to an amount that will not exceed the Technical Specification limit.

In addition to limiting conditions for operation listed under Specifications 2.4.1.b and 2.4.1.c, the reporting requirements of Specification 2.4.1.h delineate that the licensee shall identify the cause whenever the cumulative release of radioactive materials in liquid waste effluents exceeds one-half the design objective annual quantity during any calendar quarter and describe the proposed program of action to reduce such releases to design objective levels on a timely basis. This report must be filed within 30 days following the calendar quarter in which the release occurred as required by Specification 5.6.2 of these Technical Specifications.

Specification 2.4.1.i provides for reporting spillage or release events which, while below the limits of 10 CFR Part 20, could result in releases higher than the design objectives.

The sampling and monitoring requirements given under Specification 2.4.2 provide assurance that radioactive materials in liquid wastes are properly controlled and monitored in conformance with the requirements of Design Criteria 60 and 64. These requirements provide the data for the licensee and the Commission to evaluate the plant's performance

relative to radioactive liquid wastes released to the environment. Reports on the quantities of radioactive materials released in liquid waste effluents are furnished to the Commission according to Section 5.6.1 of these Technical Specifications. On the basis of such reports and any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

The points of release to the environment to be monitored in Section 2.4.2 include all the monitored release points as provided for in Table 2.4-3.

2.4.3 Specifications for Gaseous Waste Effluents

The terms used in these Specifications are as follows:

subscripts v, refers to vent releases

i, refers to individual noble gas nuclide

(Refer to Table 2.4-5 for the noble gas nuclides considered)

Q_T = the total noble gas release rate (Ci/sec)

$= \sum_i Q_i$ sum of the individual noble gas radionuclides determined to be present by isotopic analysis

$\overline{K}$ = the average total body dose factor due to gamma emission (rem/yr per Ci/sec)

$\overline{L}$ = the average skin dose factor due to beta emissions (rem/yr per Ci/sec)

$\overline{M}$ = the average air dose factor due to beta emissions (rad/yr per Ci/sec)

$\overline{N}$ = the average air dose factor due to gamma emissions (rad/yr per Ci/sec)

The values of $\overline{K}$, $\overline{L}$, $\overline{M}$ and $\overline{N}$ are to be determined each time isotopic analysis is required as delineated in Specification 2.4.4. Determine the following using the results of the noble gas radionuclide analysis:

$$\overline{K} = (1/Q_T) \sum_i Q_i K_i$$

$$\overline{L} = (1/Q_T) \sum_i Q_i L_i$$

$$\overline{M} = (1/Q_T) \sum_i Q_i M_i$$

$$\overline{N} = (1/Q_T) \sum_i Q_i N_i$$

where the values of K_i, L_i, M_i and N_i are provided in Table 2.4-5, and are site dependent gamma and beta dose factors

Q = the measured release rate of the radioiodines and radioactive materials in particulate forms with half-lives greater than eight days.

a. (1) The release rate limit of noble gases from the site shall be such that

$$2.0\left[Q_{Tv}\overline{K}_v\right] \leq 1$$

and

$$0.33\left[Q_{Tv}(\overline{L}_v + 1.1\overline{N}_v)\right] \leq 1$$

(2) The release rate limit of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days, released to the environs as part of the gaseous wastes from the site shall be such that

$$5.5 \times 10 \quad Q_v \qquad \leq 1$$

b. (1) The average release rate of noble gases from the site during any calendar quarter shall be such that

$$13\left[Q_{Tv}\overline{N}_v \quad\right] \qquad \leq 1$$

and

$$6.3\left[Q_{Tv}\overline{M}_v \quad\right] \qquad \leq 1$$

(2) The average release rate of noble gases from the site during any 12 consecutive months shall be

$$25\left[Q_{Tv}\overline{N}_v \quad\right] \qquad \leq 1$$

and

$$13\left[Q_{Tv}\overline{M}_v \quad\right] \qquad \leq 1$$

(3) The average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any calendar quarter shall be such that

$$13\left[5.5\times10^{4}Q_v \quad\right] \qquad \leq 1$$

(4) The average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any period of 12 consecutive months shall be such that

$$.25\left[5.5\times10^{4}\ Q_v \quad\right] \qquad \leq 1$$

(5) The amount of iodine-131 released during any calendar quarter shall not exceed 2 Ci/reactor.

(6) The amount of iodine-131 released during any period of 12 consecutive months shall not exceed 4 Ci/reactor.

c. Should any of the conditions of 2.4.3.c(1), (2) or (3) listed below exist, the licensee shall make an investigation to identify the causes of the release rates, define and initiate a program of action to reduce the release rates to design objective levels listed in Section 2.4 and report these actions to the NRC within 30 days from the end of the quarter during which the releases occurred.

(1) If the average release rate of noble gases from the site during any calendar quarter is such that

$$50\left[Q_{Tv}\overline{N}_v\right] > 1$$

or

$$25\left[Q_{Tv}\overline{M}_v\right] > 1$$

(2) If the average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any calendar quarter is such that

$$50\left[5.5 \times 10^4\ Q_v\right] > 1$$

(3) If the amount of iodine-131 released during any calendar quarter is greater than 0.5 Ci/reactor.

d. During the release of gaseous wastes from the primary system waste gas holdup system the effluent monitors listed in Table 2.4-4 shall be operating and set to alarm and to initiate the

automatically closure of the waste gas discharge valve prior to exceeding the limits specified in 2.4.3.a above. The operability of each automatic isolation valve shall be demonstrated quarterly.

e. The maximum activity to be contained in one waste gas storage tank shall not exceed 110,000 curies (considered as Xe-133).

f. An unplanned or uncontrolled offsite release of radioactive materials in gaseous effluents in excess of 5 curies of noble gas or 0.02 curie of radioiodine in gaseous form requires notification. This notification shall be in accordance with Specification 5.6.2.c(3).

2.4.4 Specifications for Gaseous Waste Sampling and Monitoring

a. Plant records shall be maintained and reports of the sampling and analyses results shall be submitted in accordance with Section 5.6 of these Specifications. Estimates of the sampling and analytical error associated with each reported value should be included.

b. Gaseous releases to the environment, except from the turbine building ventilation exhaust and as noted in Specification 2.4.4.c, shall be continuously monitored for gross radioactivity and the flow continuously measured and recorded. Whenever these monitors are inoperable, grab samples shall be taken and analyzed daily for gross radioactivity. If these monitors are inoperable for more than seven days, these releases shall be terminated.

c. During the release of gaseous wastes from the primary system waste gas holdup system, the gross activity monitor, the iodine collection device, and the particulate collection device shall be operating.

d. All waste gas effluent monitors shall be calibrated at least quarterly by means of a known radioactive source which has been calibrated to a National Bureau of Standards source. Each monitor shall have a functional test at least monthly and instrument check at least daily.

e. Sampling and analysis of radioactive material in gaseous waste, including particulate forms and radioiodines shall be performed in accordance with Table 2.4-2.

Bases: The release of radioactive materials in gaseous waste effluents to unrestricted areas shall not exceed the concentration limits specified in 10 CFR Part 20 and should be as low as practical in accordance with the requirements of 10 CFR Part 50.36a. These specifications provide reasonable assurance that the resulting annual air dose from the site due to gamma radiation will not exceed 10 mrad, and an annual air dose from the site due to beta radiation will not exceed 20 mrad from noble gases, that no individual in an unrestricted area will receive an annual dose to the total body greater than 5 mrem or an annual skin dose greater than 15 mrem from fission product noble gases, and that the annual dose to any organ of an individual from radioiodines and radioactive material in particulate form with half-lives greater than eight days will not exceed 15 mrem per site.

At the same time these specifications permit the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided with a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. Even with this operational flexibility under unusual operating conditions, if the licensee exerts every effort to keep levels of radioactive material in gaseous waste effluents as low as practicable, the annual releases will not exceed a small fraction of the concentration limits specified in 10 CFR Part 20.

The design objectives have been developed based on operating experience taking into account a combination of system variables including defective fuel, primary system leakage, primary to secondary system leakage, steam generator blowdown and the performance of the various waste treatment systems.

Specification 2.4.3.a(1) limits the release rate of noble gases from the site so that the corresponding annual gamma and beta dose rate above background to an individual in an unrestricted area will not exceed 500 mrem to the total body or 3000 mrem to the skin in compliance with the limits of 10 CFR Part 20.

For Specification 2.4.3.a(1), gamma and beta dose factors for the individual noble gas radionuclides have been calculated for the plant gaseous release points and are provided in Table 2.4-5. The expressions

used to calculate these dose factors are based on dose models derived in Section 7 of Meteorology and Atomic Energy-1968 and model techniques provided in Draft Regulatory Guide 1.AA.

Dose calculations have been made to determine the site boundary location with the highest anticipated dose rate from noble gases using on-site meteorological data and the dose expressions provided in Draft Regulatory Guide 1.AA. The dose expression considers the release point location, building wake effects, and the physical characteristics of the radionuclides.

The offsite location with the highest anticipated annual dose from released noble gases is 1600 meters in the North direction.

The release rate Specifications for a radioiodine and radioactive material in particulate form with half-lives greater than eight days are dependent on existing radionuclide pathways to man. The pathways which were examined for these Specifications are: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, and 3) deposition onto grassy areas where milch animals graze with consumption of the milk by man. Methods for estimating doses to the thyroid via these pathways are described in Draft Regulatory Guide 1.AA. The offsite location with the highest anticipated thyroid dose rate from radioiodines and radioactive material in particulate form with half-lives greater than eight days was determined using on-site meteorological data and the expressions described in Draft Regulatory Guide 1.AA.

Specification 2.4.3.a(2) limits the release rate of radioiodines and radioactive material in particulate form with half-lives greater than eight days so that the corresponding annual thyroid dose via the most restrictive pathway is less than 1500 mrem.

For radioiodines and radioactive material in particulate form with half-lives greater than eight days, the most restrictive location is a dairy farm located 12,000 meters in the SSW direction (vent $\chi/Q = 3.5 \times 10^{-6}$ sec/m^3).

Specification 2.4.3.b establishes upper offsite levels for the releases of noble gases and radioiodines and radioactive material in particulate form with half-lives greater than eight days at twice the design objective annual quantity during any calendar quarter, or four times the design objective annual quantity during any period of 12 consecutive months.

In addition to the limiting conditions for operation of Specifications 2.4.3.a and 2.4.3.b, the reporting requirements of 2.4.3.c provide that the cause shall be identified whenever the release of gaseous effluents exceeds one-half the design objective annual quantity during any calendar quarter and that the proposed program of action to reduce such release rates to the design objectives shall be described.

Specification 2.4.3.d requires that suitable equipment to monitor and control the radioactive gaseous releases are operating during any period these releases are taking place.

Specification 2.4.3.e limits the maximum quantity of radioactive gas that can be contained in a waste gas storage tank. The calculation of this quantity should assume instantaneous ground release, a X/Q based

5 percent meteorology, the average gross energy is 0.19 Mev per disintegration (considering Xe-133 to be the principal emitter) and exposure occurring at the minimum site boundary radius using a semi-infinite cloud model. The calculated quantity will limit the offsite dose above background to 0.5 rem or less, consistent with Commission guidelines.

Specification 2.4.3.f provides for reporting release events which, while below the limits of 10 CFR Part 20, could result in releases higher than the design objectives.

The sampling and monitoring requirements given under Specification 2.4.4 provide assurance that radioactive materials released in gaseous waste effluents are properly controlled and monitored in conformance with the requirements of Design Criteria 60 and 64. These requirements provide the data for the licensee and the Commission to evaluate the plant's performance relative to radioactive waste effluents released to the environment. Reports on the quantities of radioactive materials released in gaseous effluents are furnished to the Commission on the basis of Section 5.6.1 of these Technical Specifications. On the basis of such reports and any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

The points of release to the environment to be monitored in Section 2.4.4 include all the monitored release points as provided for in Table 2.4-4.

Specification 2.4.4.b excludes monitoring the turbine building ventilation exhaust since this release is expected to be a negligible release point. Many PWR reactors do not have turbine building enclosures. To be consistent in this requirement for all PWR reactors, the monitoring of gaseous releases from turbine buildings is not required.

2.4.5 Specifications for Solid Waste Handling and Disposal

a. Measurements shall be made to determine or estimate the total curie quantity and principle radionuclide composition of all radioactive solid waste shipped offsite.

b. Reports of the radioactive solid waste shipments, volumes, principle radionuclides, and total curie quantity, shall be submitted in accordance with Section 5.6.1.

Bases: The requirements for solid radioactive waste handling and disposal given under Specification 2.4.5 provide assurance that solid radioactive materials stored at the plant and shipped offsite are packaged in conformance with 10 CFR Part 20, 10 CFR Part 71, and 49 CFR Parts 170-178.

TABLE 2.4-1

RADIOACTIVE LIQUID SAMPLING AND ANALYSIS

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

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

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

[c] A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged.

[d] The power level and cleanup or purification flow rate at the sample time shall also be reported.

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

[f] For dissolved noble gases in water, assume a MPC of 4×10^{-5} μCi/ml of water.

TABLE 2.4-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS

Gaseous Source	Sampling Frequency	Type of Activity Analysis	Detectable Concentrations (μCi/ml)[a]
A. Waste Gas Decay Tank Releases	Each Tank	Principal Gamma Emitters	10^{-4}[b]
		H-3	10^{-6}
B. Containment Purge Releases	Each Purge	Principal Gamma Emitters	10^{-4}[c]
		H-3	10^{-6}
C. Condenser Air Ejector	Monthly	Principal Gamma Emitters	10^{-4}[b, c]
		H-3	10^{-6}
D. Environmental Release Points	Monthly (Gas Samples)	Principal Gamma Emitters	10^{-4}[b, c]
		H-3	10^{-6}
	Weekly (Charcoal Sample)	I-131	10^{-12}
	Monthly (Charcoal Sample)	I-133, I-135	10^{-10}
	Weekly (Particulates)	Principal Gamma Emitters (at least for Ba-La-140, I-131)	10^{-11}
	Monthly Composite[d] (Particulates)	Sr-89	10^{-11}
		Gross α	10^{-11}
	Quarterly Composite[d] (Particulates)	Sr-90	10^{-11}

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

[b] For certain mixtures of gamma emitters, it may not be possible to measure radionuclides at levels near their sensitivity limits when other nuclides are present in the sample at much higher levels. Under these circumstances, it will be more appropriate to calculate the levels of such radionuclides using observed ratios with those radionuclides which are measurable.

[c] Analyses shall also be performed following each refueling, startup, or similar operational occurrence which could alter the mixture of radionuclides.

[d] To be representative of the average quantities and concentrations of radioactive materials in particulate form released in gaseous effluents, samples should be collected in proportion to the rate of flow of the effluent stream.

TABLE 2.4-3

PRESSURIZED WATER REACTOR LIQUID WASTE SYSTEM
LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS

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

[a] In most PWRs the contents of the detergent waste collector tank are sampled, analyzed, and then filtered prior to release through the liquid radwaste discharge pipe. The detergent waste system should be designed with either a split tank or two separate collection or sample (test) tanks to permit isolation of the tanks for mixing, sampling, and analysis prior to release.

[b] In some PWRs processed liquid from the steam generator blowdown system is returned directly to the secondary system, and the need for continuous monitoring at this release point is eliminated.

TABLE 2.4-4

PRESSURIZED WATER REACTOR GASEOUS WASTE SYSTEM
LOCATION OF PROCESS AND EFFLUENT MONITORS AND SAMPLERS REQUIRED BY TECHNICAL SPECIFICATIONS

Process Stream or Release Point	Alarm	Auto Control to Isolation Valve	Continuous Monitor	Grab Sample Station	Measurement				
					Noble Gas	I	Particulate	H-3	Alpha
Waste Gas Storage Tanks	X	X	X	X	X	X	X	X	X
Condenser Air Ejector	X		X	X	X	X	X	X	X
Vent Header System[a]	X		X	X	X	X	X	X	X
Building Ventilation Systems									
Reactor Containment Building (whenever there is flow)	X	X	X	X	X	X	X	X	X
Auxiliary Building[a]	X		X	X	X	X	X	X	X
Fuel Handling & Storage Building[a]	X		X	X	X	X	X	X	X
Radwaste Building[a]	X		X	X	X	X	X	X	X
Steam Generator Blowdown Tank Vent or Condenser Vent[b]	X		X	X	X	X	X	X	X
Turbine Gland Seal Condenser	X		X	X	X	X	X	X	X
Mechanical Vacuum Pump	X		X	X	X	X	X	X	X
Waste Evaporator Condenser Vent[c]	X		X	X	X	X	X	X	X

[a] If any or all of the process streams or building ventilation systems are routed to a single release point, the need for a continuous monitor at the individual discharge point to the main exhaust duct is eliminated. One continuous monitor at the final release point is sufficient.

[b] In some PWRs the steam generator blowdown tank vent is routed to the main turbine condenser, and the need for a continuous monitor at this release point is eliminated.

[c] For PWRs in which the waste evaporator condenser is vented directly to the atmosphere.

Table 2.4-5

GAMMA AND BETA DOSE FACTORS FOR

St. Lucie Plant, Unit 1

$X/Q = 2.1 \times 10^{-6}$ sec/m^3

Noble Gas Radionuclide	Dose Factors for Vent			
	K_{iv} Total Body $\left(\frac{\text{rem/yr}}{\text{Ci/sec}}\right)$	L_{iv} Skin $\left(\frac{\text{rem/yr}}{\text{Ci/sec}}\right)$	M_{iv} Beta Air $\left(\frac{\text{rad/yr}}{\text{Ci/sec}}\right)$	N_{iv} Gamma Air $\left(\frac{\text{rad/yr}}{\text{Ci/sec}}\right)$
Kr-83m	5.8×10^{-5}	0	0.6	0.028
Kr-85m	0.88	3.1	4.1	0.92
Kr-85	0.014	2.8	4.1	0.015
Kr-87	1.9	20	22	2.0
Kr-88	6.0	5.0	6.2	6.3
Kr-89	0.5	21	22	0.52
Xe-131m	0.4	1.0	2.3	0.5
Xe-133m	0.3	2.1	3.1	0.41
Xe-133	0.36	0.64	2.2	0.45
Xe-135m	0.64	1.5	1.6	0.68
Xe-135	1.5	3.9	5.2	1.6
Xe-137	0.072	26	27	0.076
Xe-138	1.5	8.7	10	1.6

5.6.2 c. Nonroutine Radioactive Effluent Reports

(1) PWR Liquid Radioactive Wastes Report. If the cummulative releases of radioactive materials in liquid effluents, excluding tritium and dissolved gases, should exceed one-half the design objective annual quantity during any calendar quarter, the licensee shall make an investigation to identify the causes of such releases and define and initiate a program of action to reduce such releases to the design objective levels. A written report of these actions shall be submitted to the NRC within 30 days from the end of the quarter during which the release occurred.

(2) PWR Gaseous Radioactive Wastes Report. Should the conditions (a), (b), or (c) listed below exist, the licensee shall make an investigation to identify the causes of the release rates and define and initiate a program of action to reduce the release rates to design objective levels. A written report of these actions shall be submitted to the NRC within 30 days from the end of the quarter during which the releases occurred.

(a) If the average release rate of noble gases for the site during any calendar quarter exceeds one-half the design obejctive annual quanity.

(b) If the average release rate per site of all radioiodines and radioactive materials in particulate form with half-lives greater than eight days during any calendar quarter exceeds one-half the design objective annual quantity.

(c) If the amount of iodine-131 released during any calendar quarter is greater than 0.5 Ci/reactor.

(3) PWR Unplanned or Uncontrolled Release Report. Any unplanned or uncontrolled offsite release of radioactive materials in excess of 0.5 Curie in liquid or in excess of 5 Curies of noble gases or 0.02 Curie of radioiodines in gaseous form requires notification. This notification must be made by a written report within 30 days to the NRC. The report shall describe the event, identify the causes of the unplanned or uncontrolled release and report actions taken to prevent recurrence.