

**CHAPTER 11: RADIOACTIVE WASTE MANAGEMENT  
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## **CHAPTER 11 RADIOACTIVE WASTE MANAGEMENT**

### 11.1 SOURCE TERMS

This **section** of the referenced DCD is incorporated by reference with no departures or supplements.

## 11.2 LIQUID WASTE MANAGEMENT SYSTEMS

This **section** of the referenced DCD is incorporated by reference with the following departures and/or supplements.

### 11.2.1.2.4 Controlled Release of Radioactivity

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Replace the last paragraph in **DCD Subsection 11.2.1.2.4** with the following:

DCD The monitored radwaste discharge pipeline is engineered to preclude leakage to the environment. This pipe is routed from the auxiliary building to the radwaste building (the short section of pipe between the two buildings is fully available for visual inspection as noted above) and then out of the radwaste building to the licensed release point for dilution and discharge. The discharge radiation monitor and isolation valve are located inside the auxiliary building. The exterior piping is designed to preclude inadvertent or unidentified releases to the environment. No valves, vacuum breakers, or other fittings are incorporated outside of buildings. This greatly reduces the potential for undetected leakage from this discharge to the environment at a non-licensed release point, and supports compliance with the 10 CFR 20.1406 (Reference 5).

PTN SUP 11.2-1 The Turkey Point Units 6 & 7 liquid radwaste system (WLS) effluent discharge release point is where the WLS effluent discharge pipe connects to the blowdown sump discharge pipe to deep injection wells. The WLS effluent discharge piping is double walled piping up to this point.

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### 11.2.1.2.5.2 Use of Mobile and Temporary Equipment

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Add the following information at the end of **DCD Subsection 11.2.1.2.5.2**:

STD COL 11.2-1 When mobile or temporary equipment is selected to process liquid effluents, the equipment design and testing meets the applicable requirements of Regulatory Guide 1.143. When confirmed through sampling that the radioactive waste contents do not exceed the  $A_2$  quantities for radionuclides specified in Appendix A to 10 CFR Part 71, liquid effluent may be processed with mobile or temporary equipment in the Radwaste Building. When the  $A_2$  quantities are exceeded, liquid effluent is processed in the Seismic Category I auxiliary building.

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Mobile and temporary equipment are designed in accordance with the applicable mobile and temporary radwaste treatment systems guidance provided in Regulatory Guide 1.143, including the codes and standards listed in Table 1 of the Regulatory Guide.

Mobile or temporary equipment has the following features:

- Level indication and alarms (high-level) on tanks.
- Screwed connections are permitted only for instrument connections beyond the first isolation valve.
- Remote operated valves are used where operations personnel would be required to frequently manipulate a valve.
- Local control panels are located away from the equipment, in low dose areas.
- Instrumentation readings are accessible from the local control panels (i.e., temperature, flow, pressure, liquid level, etc.).
- Wetted parts are 300 series stainless steel, except flexible hose and gaskets.
- Flexible hose is used only for mobile equipment within the designated “black box” locations between mobile components and at the interface with the permanent plant piping.
- The contents of tanks are capable of being mixed, either through recirculation or with a mixer.
- Grab sample points are located in tanks and upstream and downstream of the process equipment.

Inspection and testing of mobile or temporary equipment is in accordance with the codes and standards listed in Table 1 of Regulatory Guide 1.143 with the following additions:

- After placement in the station, the mobile or temporary equipment is hydrostatically, or pneumatically, tested prior to tie-in to permanent plant piping.
- A functional test, using demineralized water, is performed. Remote operated valves are stroked (open-closed-open or closed-open-closed) under full flow

conditions. The proper function of the instrumentation, including alarms, is verified. The operating procedures are verified correct during the functional test.

- Tank overflows are routed to floor drains.
- Floor drains are confirmed to be functional prior to placing mobile or temporary equipment into operation.

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#### 11.2.3.5 Estimated Doses

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Replace the information in **DCD Subsection 11.2.3.5** with the following paragraphs and subsections.

PTN COL 11.2-2  
PTN COL 11.5-3

Treated liquid radioactive waste from Units 6 & 7 operation is discharged to the plant sump discharge line prior to ultimate release to the Boulder zone via the deep injection wells (see **Subsection 9.2.6.2.1**). As discussed in **Subsection 2.4.12**, the highly saline Boulder Zone of the Lower Floridan aquifer is used for deep well injection of treated municipal wastewater and reverse osmosis concentrate in Miami-Dade County. Injection occurs below the middle confining layer at depths of approximately 2900 feet or greater, approximately 900 feet below the base of the lowest underground source of drinking water. The Boulder Zone is not a source for potable water and there is no credible pathway for the injection well releases to reach potable water. Hence, there is no credible liquid effluent pathway dose due to normal plant operations and no cost benefit analysis was performed.

For off-normal operations, a conceptual receptor exposure scenario considers the Boulder Zone as a water source. Although unrealistic, this scenario bounds any other potential exposure scenarios, such as vertical migration from the Boulder Zone to potable water aquifers despite the presence of dual zone monitoring wells.

The conceptual exposure scenario requires drilling a water supply well into the Boulder Zone for water use. An initial evaluation of receptor distance from the injection wells determined a credible location of the receptor, based on distance from a centroid, considering the location of the injection wells, and land use constraints at each location. The results of this initial evaluation are summarized in the paragraphs below.

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Receptor 1 is located southeast of the injection wells at an approximate distance of 2084 feet. This location is part of Biscayne National Park. The location is not considered a realistic receptor location for a water supply well since it is located on land that is only accessible from Biscayne Bay, would generally not be considered usable for applications that would require a freshwater supply, and access would likely not be granted by the U.S. Department of the Interior. This scenario was therefore determined to be unrealistic and was not further considered.

Receptor 2 is located north of the injection wells at an approximate distance of 9824 feet. This location is located in Homestead Bayfront Park. The location is not considered a realistic location for a water supply well since it is located within a county park and therefore is unlikely to be a realistic area usable for applications that would require a freshwater water supply (e.g. residence). This receptor location was therefore determined to be unrealistic and was not further considered.

Receptor 3 is located northwest of the injection wells at an approximate distance of 9776 feet. This location is on land not owned by FPL and is considered a realistic location for the installation and use of a water supply well in the Boulder zone. For off-normal operations, this location was therefore determined to be the closest location for assessment of liquid effluent doses.

In order to determine the decay time for the injectate front to reach Receptor 3, an analysis was performed that considered the injection rate, aquifer thickness, and porosity of the Boulder zone. The resulting time required for the injectate to reach Receptor 3 is approximately 13.7 years. This horizontal travel time through the Boulder Zone is used in the dose calculation described below.

The NRC-endorsed LADTAP II computer program is used to calculate doses to an individual at Receptor 3 from liquid effluents. This program implements the radiological exposure models described in RG 1.109 to estimate the doses. The following exposure pathways are considered in LADTAP II:

- Consumption of drinking water
- Consumption of meats and vegetables produced with irrigation water (there are no milk animals within five miles of the plant)

The site-specific input parameters used in LADTAP II are the following:

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- Liquid effluent discharge — A discharge rate of 27.9 cfs is used, corresponding to the reclaimed water dilution flow rate of 12,500 gpm, which bounds the saltwater discharge rate of approximately 58,000 gpm, as it yields less dilution.
- Source terms — The isotopic activity releases are from [DCD Table 11.2-7](#).
- Irrigation rate — The irrigation rate is 110 L/m<sup>2</sup>-month, corresponding to 1 inch per week.
- Transit time — The transit time from discharge to drinking water and irrigated foods is 13.7 years, the time required for the injectate to reach Receptor 3.

The resulting maximum doses per unit are 2.5 mrem to the total body, 2.4 mrem to the thyroid, and 3.1 mrem to the liver of a child. Even though these doses are not due to normal operations, they conform to the 10 CFR 50, Appendix I guidelines of 3 mrem total body and 10 mrem organ.

The above doses were evaluated for off-normal events. Therefore, consistent with RG 1.110, no cost benefit analysis was performed.

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#### 11.2.3.6 Quality Assurance

Add the following to the end of [DCD Subsection 11.2.3.6](#):

STD SUP 11.2-1 Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation and testing provisions of the liquid radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

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#### 11.2.5 COMBINED LICENSE INFORMATION

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11.2.5.1 Liquid Radwaste Processing by Mobile Equipment

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STD COL 11.2-1 This COL Item is addressed in [Subsection 11.2.1.2.5.2](#).

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11.2.5.2 Cost Benefit Analysis of Population Doses

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PTN COL 11.2-2 This COL item is addressed in [Subsection 11.2.3.5](#).

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### 11.3 GASEOUS WASTE MANAGEMENT SYSTEM

This **section** of the referenced DCD is incorporated by reference with the following departures and/or supplements.

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STD SUP 11.3-2 11.3.3 Radioactive releases

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Add the following new paragraph at the end of **DCD Subsection 11.3.3**:

There are no gaseous effluent site interface parameters outside of the Westinghouse scope.

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#### 11.3.3.4 Estimated Doses

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Add the following information at the end of **DCD Subsection 11.3.3.4**.

PTN COL 11.5-3 With the annual airborne releases listed in **DCD Table 11.3-3**, the Units 6 & 7 site specific air doses at ground level at the site boundary are 4.2 mrad for gamma radiation and 18 mrad for beta radiation. These doses are based on the annual average atmospheric dispersion factor from FSAR **Section 2.3**. These doses are below the 10 CFR Part 50, Appendix I design objectives of 10 mrad per year for gamma radiation or 20 mrad per year for beta radiation.

Doses and dose rates to people were calculated using the GASPAR II computer code. This code is based on the methodology presented in the RG 1.109. Factors common to both estimated individual dose rates and estimated population dose are addressed in this subsection. Unique data is addressed in the respective subsections.

Exposure pathways considered for the individual are plume, ground deposition, inhalation, and ingestion of vegetables and meat. Exposure pathways considered for the population are plume, ground deposition, inhalation, and ingestion of vegetables, meat, and milk (both cow and goat).

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Based on site meteorological conditions, the highest rate of plume exposure and ground deposition occurs at the site boundary 0.56 kilometers (0.35 miles) south-southeast of the plant (Figure 2.1-204).

The projected population distribution within 81 kilometers (50 miles) of the site in the year 2090 is in FSAR Figure 2.1-225b.

Agricultural products are estimated from U. S. Department of Agriculture National Agricultural Statistics Service. Vegetable, milk, and meat production data is in FSAR Table 11.3-203.

#### 11.3.3.4.1 Estimated Individual Doses

Dose rates to individuals are calculated for airborne decay and deposition, inhalation, and ingestion of meat and vegetables. Because there are no milk animals identified within 5 miles of Units 6 & 7, no dose from ingestion of milk is calculated. Dose from plume and ground deposition are calculated as affecting all age groups equally.

Plume exposure at the site boundary, 0.56 kilometers (0.35 miles) south-southeast of Units 6 & 7, produces a maximum dose rate to a single organ of 13 mrem/year to skin. The maximum total body dose rate was calculated to be 2.6 mrem/year.

Ground deposition at the site boundary, 0.56 kilometers (0.35 miles) south-southeast of Units 6 & 7, produces a maximum dose rate to a single organ of 1.2 mrem/year to skin. The maximum total body dose rate was calculated to be 1.1 mrem/year.

Inhalation dose at the nearest residence, 4.3 kilometers (2.7 miles) north of Units 6 & 7, results in a maximum dose rate to a single organ of 0.014 mrem/year to a child's thyroid. The maximum total body dose rate is calculated to be 0.0012 mrem/year to a teenager.

Vegetable consumption assumes that the dose is received from the nearest garden, 7.7 kilometers (4.8 miles) northwest of the plant. The GASP II default vegetable consumption values are used in lieu of site-specific vegetable consumption data as permitted by RG 1.109. The maximum dose rate to a single organ is 0.20 mrem/year to a child's thyroid. The maximum total body dose rate is calculated to be 0.020 mrem/year to a child.

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Meat consumption assumes that the dose is received from the nearest meat animal, 4.3 kilometers (2.7 miles) north of Units 6 & 7. The GASPAR II default meat consumption values are used in lieu of site-specific meat consumption data as permitted by RG 1.109. The maximum dose rate to a single organ is 0.018 mrem/year to a child's bone. The maximum total body dose rate is calculated to be 0.0038 mrem/year to a child.

The milk pathway to the individual is not considered because there are no milk animals within 5 miles of Units 6 & 7.

The maximum dose rate to any organ considering every pathway is calculated to be 0.24 mrem/year to a child's thyroid. The maximum total body dose rate is calculated to be 0.038 mrem/year to a child, which includes the pathway doses (meat, vegetable, and inhalation) plus the plume and ground deposition doses (Table 11.3-204). These are below the 10 CFR Part 50, Appendix I design objectives of 5 mrem/year to total body, and 15 mrem/year to any organ, including skin.

Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest residence, meat animal, garden, and the site boundary is located in FSAR Section 2.3. Table 11.3-204 contains total organ dose rates based on age group. Table 11.3-205 contains total air doses at each special location.

#### 11.3.3.4.2 Estimated Population Dose

The estimated population dose within 81 kilometers (50 miles) is calculated as 4.7 person-rem total body and 8.7 person-rem thyroid per unit. Table 11.3-206 contains the estimated population doses by nuclide group (noble gases, iodines, particulates, C-14, and H-3).

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PTN COL 11.3-1 11.3.3.4.3 Gaseous Radwaste Cost Benefit Analysis Methodology

The methodology of Regulatory Guide 1.110 was used to satisfy the cost benefit analysis requirements of 10 CFR Part 50, Appendix I, Section II.D. The parameters used in calculating the Total Annual Cost (TAC) are fixed and are given for each radwaste treatment system augment listed in Regulatory Guide 1.110, including the Annual Operating Cost (AOC) (Table A-2), Annual Maintenance Cost (AMC) (Table A-3), Direct Cost of Equipment and Materials

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(DCEM) (Table A-1), and Direct Labor Cost (DLC) (Table A-1). The following variable parameters were used:

- Capital Recovery Factor (CRF) — This factor is taken from Table A-6 of Regulatory Guide 1.110 and reflects the cost of money for capital expenditures. A cost-of-money value of 7 percent per year is assumed in this analysis, consistent with the "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (NUREG/BR-0058). A CRF of 0.0806 was obtained from Table A-6.
- Indirect Cost Factor (ICF) — This factor takes into account whether the radwaste system is unitized or shared (in the case of a multi-unit site) and is taken from Table A-5 of RG 1.110. It is assumed that the radwaste system for this analysis is a unitized system at a 2-unit site, which equals an Indirect Cost Factor of 1.625.
- Labor Cost Correction Factor (LCCF) — This factor takes into account the differences in relative labor costs between geographical regions and is taken from Table A-4 of Regulatory Guide 1.110. A factor of 1 (the lowest value) is assumed in this analysis.

The value of \$1000 per person-rem is prescribed in Appendix I to 10 CFR Part 50.

The analysis used a conservative assumption that the respective radwaste treatment system augment is a "perfect" system that reduces the effluent and dose by 100 percent. The gaseous radwaste treatment system augment's annual costs were determined and the lowest annual cost considered a threshold value. The lowest-cost option for gaseous radwaste treatment system augments is the Steam Generator Flash Tank Vent to Main Condenser at \$6320 per year, which yields a threshold value of 6.32 person-rem total body or thyroid from gaseous effluents.

For AP1000 sites with population dose estimates less than 6.32 person-rem total body or thyroid dose from gaseous effluents, no further cost-benefit analysis is needed to demonstrate compliance with 10 CFR Part 50, Appendix I Section II.D.

#### 11.3.3.4.4 Gaseous Radwaste Cost Benefit Analysis

The Units 6 & 7 population doses are given in [Subsection 11.3.3.4.2](#). The augments provided in RG 1.110 were reviewed and were found not to be cost beneficial in reducing the population dose of 4.7 person-rem total body and 8.7 person-rem thyroid. The lowest cost gaseous radwaste system augment is

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\$6320, which would be \$6320/4.7 person-rem total body or \$1345 per person-rem total body, and \$6320/8.7 person-rem thyroid or \$726 per person-rem thyroid. The total body cost per person-rem reduction exceeds the \$1000 per person-rem criterion provided in RG 1.110 and is therefore not cost beneficial. Although the cost of thyroid dose reduction is below the threshold, this is assuming the augment completely eliminates the dose. As shown in [Table 11.3-206](#), 2.4 of the 8.7 person-rem thyroid dose is due to noble gases, which will not be mitigated by the Steam Generator Flash Tank Vent to Main Condenser. With the noble gas contribution unaffected by the augment, the cost of thyroid dose reduction is \$1003 per person-rem thyroid. Although the cost of \$1003 is nearly equal to the benefit of \$1000, this augment is for the addition of a vent to a flash tank that is presumed to exist. Since the AP1000 design does not include a flash tank, the cost of the tank would have to be added to the cost of this augment, further increasing the cost relative to the benefit.

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#### 11.3.3.6 Quality Assurance

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STD SUP 11.3-1 Add the following to the end of [DCD Subsection 11.3.3.6](#):

Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation, and testing provisions of the gaseous radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

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### 11.3.5 COMBINED LICENSE INFORMATION

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#### 11.3.5.1 Cost Benefit Analysis of Population Doses

PTN COL 11.3-1 This COL Item is addressed in [Subsections 11.3.3.4.3](#) and [11.3.3.4.4](#).

PTN COL 11.5-3 This COL Item is addressed in [Subsection 11.3.3.4](#).

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**Table 11.3-201  
GASPAR II Input**

PTN COL 11.3-1

PTN COL 11.5-3

<b>Input Parameter</b>	<b>Value</b>
Number of Source Terms	1
Source Term	DCD Table 11.3-3
Population Data	Table 11.3-202
Fraction of the year leafy vegetables are grown	1.0
Fraction of the year milk cows are on pasture	1.0 <sup>(a)</sup>
Fraction of max individual's vegetable intake from own garden	0.76
Fraction of the year goats are on pasture	1.0
Fraction of goat feed intake from pasture while on pasture	1.0
Fraction of the year beef cattle are on pasture	1.0
Fraction of beef-cattle feed intake from pasture while on pasture	1.0
<b>Total Production Rate for the 50-mile area</b>	
– Vegetables (kg/yr)	Table 11.3-203
– Milk (l/yr)	Table 11.3-203
– Meat (kg/yr)	Table 11.3-203
Special Location Data	FSAR Section 2.3.5

(a) There are no milk cows identified within 5 miles of Units 6 & 7.

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PTN COL 11.3-1  
PTN COL 11.5-3

**Table 11.3-202  
Population Distribution in 2090**

Direction	Distance (miles)									
	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S						66	2,568	17		
SSW						8	402	11,262	7,143	1,292
SW										159
WSW							1,435	23	4	57
W						24,084	15,239			
WNW						121,480	44,940	39		6
NW				3		74,985	25,201	149	5	
NNW						46,785	573,963	251,231	373	
N	3,829		6,267			28,328	549,824	1,189,803	1,359,114	1,363,111
NNE							13,086	1,014,000	1,051,234	607,175
NE										
ENE										
E						16				
ESE										
SE						75				
SSE						8,887				
Total	3,829	0	6,267	3	0	304,714	1,226,658	2,466,524	2,417,873	1,971,800
<b>Grand Total</b>										8,397,668

Note: Based on [Figures 2.1-215b](#) and [2.1-225](#).



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PTN COL 11.3-1

PTN COL 11.5-3

**Table 11.3-203  
Vegetable, Milk, and Meat Production Data**

Food	State Production <sup>(a)</sup>				Production Basis <sup>(b)</sup>			50-Mile Fraction <sup>(c)</sup>	50-Mile Production <sup>(d)</sup>			
					Measure	State	50-mile		Current		2090	
Red Meat	6.67E+07	lbm	3.03E+07	kg	No. of beef cows	9.82E+05	2.01E+03	2.05E-03	6.19E+04	kg	1.67E+05	kg
Broilers	4.25E+08	lbm	1.93E+08	kg	No. of broilers	1.97E+07	3.44E+02	1.74E-05	3.36E+03	kg	9.08E+03	kg
Milk	2.11E+08	lbm	9.57E+07	L	No. of milk cows	1.45E+05	6.60E+01	4.56E-04	4.36E+04	L	1.18E+05	L
Vegetables	5.18E+07	cwt	2.35E+09	kg	Harvested acres	2.31E+06	5.95E+04	2.57E-02	6.04E+07	kg	1.63E+08	kg

- (a) State Production — The production rates are converted into units of kilograms; milk density is assumed to be 1 kilogram/liter. State production values are from U.S. Department of Agriculture:  
 Broilers, milk and vegetables — *Florida Annual Statistical Bulletin 2008*, National Agricultural Statistics Service, [http://www.nass.usda.gov/Statistics\\_by\\_State/Florida/Publications/Annual\\_Statistical\\_Bulletin/fasd08p.htm](http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Annual_Statistical_Bulletin/fasd08p.htm). (Reference 202)  
 Red meat — *Commercial Red Meat: Production, by State and U.S.*, U.S. Department of Agriculture, National Agricultural Statistics Bulletin, p. 102, [http://www.nass.usda.gov/Statistics\\_by\\_State/Iowa/Publications/Annual\\_Statistical\\_Bulletin/2007/07\\_102.pdf](http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/Annual_Statistical_Bulletin/2007/07_102.pdf). (Reference 203)
- (b) Production Basis — The production bases for the state and the four counties (Broward, Collier, Dade, and Monroe) within 50 miles of the plant. The production values are from U.S. Department of Agriculture:  
*2002 Census of Agriculture*, Florida State and County Data, Volume 1, U.S. Department of Agriculture, June 2004, [www.nass.usda.gov/census/census02/volume1/fl/FLVolume104.pdf](http://www.nass.usda.gov/census/census02/volume1/fl/FLVolume104.pdf). (Reference 204)
- (c) 50-Mile Fraction — The fraction of production within 50 miles is obtained by dividing the 50-mile value by the state value.
- (d) 50-Mile Production — The current 50-mile production is obtained by multiplying the state production by the 50-mile fraction. The 2090 production is obtained by multiplying the current production by 2.70, representing the population increase from 3,113,185 in 2000 to 8,397,668 in 2090.

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PTN COL 11.5-3

**Table 11.3-204  
Individual Dose Rates**

Location <sup>(a)</sup>	Pathway	Dose Rate per Unit (mrem/yr) <sup>(b)</sup>								
		Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin	
Residence 2.7 mi N	External	Plume	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0074	0.046
		Ground	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0077
		Total	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.053
	Inhalation	Adult	0.0012	0.0012	0.00016	0.0012	0.0012	0.0096	0.0015	0
		Teen	0.0012	0.0012	0.00019	0.0012	0.0012	0.012	0.0016	0
		Child	0.0010	0.0010	0.00023	0.0011	0.0011	0.014	0.0014	0
		Infant	0.00059	0.00058	0.00012	0.00063	0.00063	0.012	0.00087	0
Garden 4.8 miles NW	Vegetable	Adult	0.0064	0.0065	0.033	0.0064	0.0061	0.086	0.0055	0
		Teen	0.0092	0.0093	0.050	0.0096	0.0091	0.11	0.0083	0
		Child	0.020	0.019	0.11	0.021	0.020	0.21	0.018	0
Meat Animal 2.7 miles N	Meat	Adult	0.0026	0.0036	0.011	0.0027	0.0026	0.0094	0.0025	0
		Teen	0.0021	0.0027	0.0095	0.0022	0.0021	0.0070	0.0020	0
		Child	0.0038	0.0040	0.018	0.0039	0.0038	0.011	0.0037	0
MEI <sup>(c)</sup> — Sum of Residence, Garden, Meat Animal	All	Adult	0.023	0.025	0.058	0.023	0.023	0.12	0.023	0.053
		Teen	0.026	0.026	0.073	0.026	0.026	0.14	0.026	0.053
		Child	0.038	0.037	0.15	0.039	0.038	0.24	0.037	0.053
		Infant	0.014	0.014	0.013	0.014	0.014	0.025	0.015	0.053

(a) Locations are from [Table 2.3.5-202](#).

(b) 10 CFR 50 Appendix I: Total body dose limit = 5 mrem/year, skin dose = 15 mrem/year, and dose to any organ = 15 mrem/year.

(c) MEI dose rates represent the summation of dose rates from each pathway (plume, ground, inhalation, vegetable, and meat).

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PTN COL 11.5-3

**Table 11.3-205**  
**Doses in Millirads at Special Locations per Unit**

Special Location	Beta Air Dose	Gamma Air Dose
Site Boundary <sup>(a)</sup>	18	4.2
Nearest Residence/Meat Animal	0.068	0.012
Nearest Vegetable Garden	0.048	0.0099

(a) 10 CFR 50 Appendix I Design Objective: Gamma Air Dose = 10 mrad and Beta Air Dose = 20 mrad.

PTN COL 11.5-3

**Table 11.3-206**  
**Estimated Population Doses per Unit**

	Dose (person-rem/yr)	
	Total Body	Thyroid
Noble Gases	2.4	2.4
Iodines	0.015	4.0
Particulates	1.4	1.4
C-14	0.32	0.32
H-3	0.56	0.56
Total	4.7	8.7

#### 11.4 SOLID WASTE MANAGEMENT

This **section** of the referenced DCD is incorporated by reference with the following departures and/or supplements.

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##### 11.4.5 QUALITY ASSURANCE

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Add the following information to the end of **DCD Subsection 11.4.5**:

- STD SUP 11.4-1 Since the impact of radwaste systems on safety is limited, the extent of control required by Appendix B to 10 CFR Part 50 is similarly limited. Thus, a supplemental quality assurance program applicable to design, construction, installation and testing provisions of the solid radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.
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##### 11.4.6 COMBINED LICENSE INFORMATION FOR SOLID WASTE MANAGEMENT SYSTEM PROCESS CONTROL PROGRAM

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Add the following information to the end of **DCD Subsection 11.4.6**.

This COL Item is addressed below.

- STD COL 11.4-1 A Process Control Program (PCP) is developed and implemented in accordance with the recommendations and guidance of NEI 07-10A (**Reference 201**). The PCP describes the administrative and operational controls used for the solidification of liquid or wet solid waste and the dewatering of wet solid waste. Its purpose is to provide the necessary controls such that the final disposal waste product meets applicable federal regulations (10 CFR Parts 20, 50, 61, 71, and 49 CFR Part 173), state regulations, and disposal site waste form requirements for burial at a low level waste (LLW) disposal site that is licensed in accordance with 10 CFR Part 61.

Waste processing (solidification or dewatering) equipment and services may be provided by the plant or by third-party vendors. Each process used meets the applicable requirements of the PCP.

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No additional onsite radwaste storage is required beyond that described in the DCD.

**Table 13.4-201** provides milestones for PCP implementation.

PTN SUP 11.4-1 Low-level radioactive waste is packaged to meet transportation and disposal site acceptance requirements. Packaging of waste for offsite shipment complies with applicable DOT (49 CFR Parts 173 and 178) and NRC regulations (10 CFR Part 71) for transportation of radioactive material. The packaged waste is stored on site on an interim basis before being shipped offsite to a licensed processing, storage, or disposal facility. Onsite storage for more than a year at the maximum rate of generation is provided in the waste accumulation room of the radwaste building. Radioactive waste is shipped offsite by truck.

Consistent with current commercial agreements, a third-party contractor processes, stores, owns, and ultimately disposes of low-level waste generated as a result of operations. Activities associated with the transportation, processing, and ultimate disposal of low-level waste comply with applicable laws and regulations in order to ensure the public's health and safety. In particular, the third-party contractor conducts its operations consistent with NRC regulations (e.g., 10 CFR Part 20).

Under 10 CFR 20.2001, reactor licensees may transfer low-level radioactive waste material to another licensee that is specifically licensed to accept and treat waste prior to disposal. Studsvik, Inc., has a licensed low-level radioactive waste treatment facility in Erwin, Tennessee. FPL has signed a letter of intent with Studsvik to enter into negotiations for a contract for the performance of work by Studsvik to include the shipment, processing, storage, and disposal of low-level radioactive waste produced by Units 6 & 7 (**Reference 205**). Under the proposed contract, Studsvik would treat the Class B and C waste at its Erwin, Tennessee facility and thereafter take responsibility for storage and final disposal.

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#### 11.4.6.1 Procedures

STD SUP 11.4-1 Operating procedures specify the processes to be followed to ship waste that complies with the waste acceptance criteria (WAC) of the disposal site, 10 CFR 61.55 and 61.56, and the requirements of third party waste processors.

Each waste stream process is controlled by procedures that specify the process for packaging, shipment, material properties, destination (for disposal or further

processing), testing to verify compliance, the process to address non-conforming materials, and required documentation.

Where materials are to be disposed of as non-radioactive waste (as described in **DCD Subsection 11.4.2.3.3**), final measurements of each package are performed to verify there has not been an accumulation of licensed material resulting from a buildup of multiple, non-detectable quantities. These measurements are obtained using sensitive scintillation detectors, or instruments of equal sensitivity, in a low-background area.

Procedures document maintenance activities, spill abatement, upset condition recovery, and training.

Procedures document the periodic review and revision, as necessary, of the PCP based on changes to the disposal site, WAC regulations, and third party PCPs.

#### 11.4.6.2 Third Party Vendors

Third party equipment suppliers and/or waste processors are required to supply approved PCPs. Third party vendor PCPs describe compliance with Regulatory Guide 1.143, Generic Letter 80-09, and Generic Letter 81-39. Third party vendor PCPs are referenced appropriately in the plant PCP before commencement of waste processing.

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#### 11.4.7 REFERENCES

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201. NEI 07-10A, *Generic FSAR Template Guidance for Process Control Program (PCP)*, Revision 0, March 2009.
202. *Florida Annual Statistical Bulletin 2008*, National Agricultural Statistics Service. Available at [http://www.nass.usda.gov/Statistics\\_by\\_State/Florida/Publications/Annual\\_Statistical\\_Bulletin/fasd08p.htm](http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Annual_Statistical_Bulletin/fasd08p.htm).
203. *Commercial Red Meat: Production, by State and U.S.*, U.S. Department of Agriculture, National Agricultural Statistics Bulletin, p. 102. Available at [http://www.nass.usda.gov/Statistics\\_by\\_State/Iowa/Publications/Annual\\_Statistical\\_Bulletin/2007/07\\_102.pdf](http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/Annual_Statistical_Bulletin/2007/07_102.pdf).

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204. *2002 Census of Agriculture*, Florida State and County Data, Volume 1, U.S. Department of Agriculture, June 2004. Available at [www.nass.usda.gov/census/census02/volume1/fl/FLVolume104.pdf](http://www.nass.usda.gov/census/census02/volume1/fl/FLVolume104.pdf).
  205. FPL 2009. Florida Power & Light Company. Letter of Intent Between Florida Power & Light Company and Studsvik, Inc., May 22, 2009.
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## 11.5 RADIATION MONITORING

This **section** of the referenced DCD is incorporated by reference with the following departures and/or supplements.

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### 11.5.1.2 Power Generation Design Basis

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Revise the fourth bullet in **DCD Subsection 11.5.1.2** as follows:

- PTN COL 11.5-2
- Data collection and data storage to support compliance reporting for the applicable NRC requirements and guidelines, such as General Design Criterion 64 and Regulatory Guide 1.21 and Regulatory Guide 4.15, Revision 2.
- 

### 11.5.2.4 Inservice Inspection, Calibration, and Maintenance

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Add the following information at the end of **DCD Subsection 11.5.2.4**:

STD COL 11.5-2

Daily checks of effluent monitoring system operability are made by observing channel behavior. Detector response is routinely observed with a remotely-positioned check source in accordance with plant procedures. Instrument background count rate is also observed to determine proper functioning of the monitors. Any detector whose response cannot be verified by observation during normal operation or by using the remotely-positioned check source can have its response checked with a portable check source. A record is maintained showing the background radiation level and the detector response.

Calibration of the continuous radiation monitors is done with commercial radionuclide standards that have been standardized using a measurement system traceable to the National Institute of Standards and Technology.

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## 11.5.3 EFFLUENT MONITORING AND SAMPLING

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Add the following information at the end of [DCD Subsection 11.5.3](#).

PTN COL 11.5-2 Units 6 & 7 use the existing fleet program for quality assurance of radiological effluent and environmental monitoring that is based on RG 4.15, Revision 2.

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#### 11.5.4 PROCESS AND AIRBORNE MONITORING AND SAMPLING

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Add the following information at the end of the first paragraph in [DCD Subsection 11.5.4](#).

PTN COL 11.5-2 The sampling program for liquid and gaseous effluents will conform to RG 4.15, Revision 2 (see [Appendix 1AA](#)).

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Add the following information at the end of [DCD Subsection 11.5.4](#).

##### 11.5.4.1 Effluent Sampling

STD COL 11.5-2 Effluent sampling of potential radioactive liquid and gaseous effluent paths is conducted on a periodic basis to verify effluent processing meets the discharge limits to offsite areas. The effluent sampling program provides the information for the effluent measuring and reporting required by 10 CFR 50.36a and 10 CFR Part 20 and implemented through the Offsite Dose Calculation Manual (ODCM) and plant procedures. The frequency of the periodic sampling and analyses described herein are nominal and may be increased as permitted by procedure. [Tables 11.5-201](#) and [11.5-202](#) summarize the sample and analysis schedules and sensitivities, respectively. The information contained in [Tables 11.5-201](#) and [11.5-202](#) are derived from Regulatory Guide 1.21.

Laboratory isotopic analyses are performed on continuous and batch effluent releases in accordance with the ODCM. Results of these analyses are compiled and appropriate portions are utilized to produce the Radioactive Effluent Release Report.

##### 11.5.4.2 Representative Sampling

Representative samples are obtained from well-mixed stream of volumes of effluent liquid through the use of proper sampling equipment, proper location of sampling points, and the development and use of sampling procedures. The

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recommendations of ANSI N 42.18 ([Reference 203](#)) are considered for the selection of instrumentation specific to the continuous monitoring of radioactivity in liquid effluents.

Sampling of effluent liquids is consistent with guidance in Regulatory Guide 1.21. When practical, effluent releases are batch-controlled, and prior to sampling, large volumes of liquid waste are mixed, in as short a time span as practicable, so that solid particulates are uniformly distributed in the liquid volume. Sampling and analysis is performed, and release conditions set, before release. Sample points are located to minimize flow disturbance due to fittings and other characteristics of equipment and components. Sample lines are flushed consistent with plant procedures to remove sediment deposits.

Representative sampling of process effluents is attained through sample and monitor locations and methods and criteria detailed in plant procedures.

Composite sampling is employed to analyze for hard to measure radionuclides and to monitor effluent streams that normally are not expected to contain significant amounts of radioactive contamination. Composite liquid samples are collected in proportion to the volume of each batch of effluent release. The composite is thoroughly mixed prior to analysis. Collection periods for composites are as short as practicable and periodic checks are performed to identify changes in composite samples. When grab samples are collected instead of composite samples, the time of the sample, location, and frequency are considered to provide a representative sample of the radioactive materials.

The pressure head of the fluid, if available, is used for taking samples. If sufficient pressure head is not available to take samples, then sample pumps are used to draw the sample from the process fluid to the detector panels and back to the process.

Testing and obtaining representative samples using the radiation monitors described in [DCD Subsection 11.5](#) will be performed in accordance with ANSI N13.1 ([Reference 201](#)).

For obtaining representative samples in unfiltered ducts, isokinetic probes are tested and used as recommended by ANSI N13.1 ([Reference 201](#)).

#### Analytical Procedures

Typically, samples of process and effluent gases and liquids are analyzed in the station laboratory or by an outside laboratory via the following techniques:

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- Gross alpha/beta counting
- Gamma spectrometry
- Liquid scintillation counting

"Available" instrumentation and counting techniques change as other instruments and techniques become available. For this reason, the frequency of sampling and the analysis of samples are generalized in this subsection.

Gross alpha/beta analysis may be performed directly on unprocessed samples (e.g., air filters) or on processed samples (e.g., evaporated liquid samples). Sample volume, counting geometry, and counting time are chosen to match measurement capability with sample activity. Correction factors for sample detector geometry, self-absorption and counter resolving time are applied to provide the required accuracy.

Liquid effluent samples are prepared for alpha/beta counting by evaporation onto steel planchets. Gamma analysis may be done on any type of sample (gas, solid or liquid) in a gamma spectrometer.

Tritiated water vapor samples are collected by condensation or adsorption, and the resultant liquid is analyzed by liquid scintillation counting techniques.

Radiochemical separations are used for the routine analysis of Sr-89 and Sr-90.

Liquid samples are collected in polyethylene bottles to minimize absorption of nuclides onto container walls.

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#### 11.5.6.5 Quality Assurance

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Add the following information at the end of **DCD Subsection 11.5.6.5**.

PTN COL 11.5-2 The sampling program and the associated monitors conform to RG 4.15, Revision 2 (see **Appendix 1AA**).

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### 11.5.8 COMBINED LICENSE INFORMATION

STD COL 11.5-1 An Offsite Dose Calculation Manual (ODCM) is developed and implemented in accordance with the recommendations and guidance of NEI 07-09A (Reference 202). The ODCM contains the methodology and parameters used for calculating doses resulting from liquid and gaseous effluents. The ODCM addresses operational setpoints, including planned discharge rates, for radiation monitors and monitoring programs (process and effluent monitoring and environmental monitoring) for the control and assessment of the release of radioactive material to the environment. The ODCM provides the limitations on operation of the radwaste systems, including functional capability of monitoring instruments, concentrations of effluents, sampling, analysis, 10 CFR Part 50, Appendix I dose and dose commitments, and reporting. The ODCM will be finalized prior to fuel load with site-specific information.

Table 13.4-201 provides milestones for ODCM implementation.

STD COL 11.5-2 This COL Item is addressed in Subsections 11.5.2.4, 11.5.4.1, 11.5.4.2.

PTN COL 11.5-2 This COL Item is addressed in Subsections 11.5.1.2, 11.5.3, 11.5.4, and 11.5.6.5.

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PTN COL 11.5-3 This COL Item is addressed in Subsection 11.2.3.5 and 11.3.3.4 for liquid and gaseous effluents, respectively.

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Add the following subsection after DCD Subsection 11.5.8.

### 11.5.9 REFERENCES

201. ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities."
  202. NEI 07-09A, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description," Revision 0, March 2009.
  203. ANSI N42.18-2004, "Specification and Performance of On-Site Instrumentation for Continuous Monitoring Radioactivity in Effluents."
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STD COL 11.5-2

**Table 11.5-201**  
**Minimum Sampling Frequency**

Stream	Sampled Medium	Frequency
Gaseous	Continuous Release	A sample is taken within one month of initial criticality, and at least weekly thereafter to determine the identity and quantity for principal nuclides being released. A similar analysis of samples is performed following each refueling, process change, or other occurrence that could alter the mixture of radionuclides.
		When continuous monitoring shows an unexplained variance from an established norm.
		Monthly for tritium.
	Batch Release	Prior to release to determine the identity and quantity of the principal radionuclides (including tritium).
	Filters (particulates)	Weekly.
		Quarterly for Sr-89 and Sr-90.
		Monthly for gross alpha.
Liquid	Continuous Releases	Weekly for principal gamma-emitting radionuclides.
		Monthly, a composite sample for tritium and gross alpha.
		Monthly, a representative sample for dissolved and entrained fission and activation gases.
		Quarterly, a composite sample for Sr-89, Sr-90, and Fe-55.
	Batch Releases	Prior to release for principal gamma-emitting radionuclides.
		Monthly, a composite sample for tritium and gross alpha.
		Monthly, a representative sample from at least one representative batch for dissolved and entrained fission and activation gases.
		Quarterly, a composite sample for Sr-89, Sr-90 and Fe-55.

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STD COL 11.5-2

**Table 11.5-202**  
**Minimum Sensitivities**

Stream	Nuclide	Sensitivity
Gaseous	Fission & Activation Gases	1.0E-04 $\mu\text{Ci/cc}$
	Tritium	1.0E-06 $\mu\text{Ci/cc}$
	Iodines & Particulates	Sufficient to permit measurement of a small fraction of the activity that would result in annual exposures of 15 mrem to thyroid for iodines, and 15 mrem to any organ for particulates, to an individual in an unrestricted area.
	Gross Radioactivity	Sufficient to permit measurement of a small fraction of the activity that would result in annual air dose of 1) 10 mrad due to gamma, and 2) 20 mrad of beta at any location near ground level at or beyond the site boundary.
Liquid	Gross Radioactivity	1.0E-07 $\mu\text{Ci/ml}$
	Gamma-emitters	5.0E-07 $\mu\text{Ci/ml}$
	Dissolved & Entrained Gases	1.0E-05 $\mu\text{Ci/ml}$
	Gross Alpha	1.0E-07 $\mu\text{Ci/ml}$
	Tritium	1.0E-05 $\mu\text{Ci/ml}$
	Sr-89 & Sr-90	5.0E-08 $\mu\text{Ci/ml}$
	Fe-55	1.0E-06 $\mu\text{Ci/ml}$