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

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

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 10 CFR 20.1406 (Reference 5).

BLN SUP 11.2-1

The exterior radwaste discharge piping is enclosed within a guard pipe and monitored for leakage. Liquid radwaste effluent will be discharged to the Tennessee River (Guntersville Reservoir) with cooling tower blowdown. The cooling tower blowdown line is sealed and monitored for leakage.

11.2.1.2.5.2 Use of Mobile and Temporary Equipment

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, the 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.

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 and temporary equipment have 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.

11.2.3 RADIOACTIVE RELEASES

BLN SUP 11.2-2 Add the following new paragraph at the end of DCD Subsection 11.2.3:

The only liquid effluent site interface parameter outside of the Westinghouse scope is the release point to the Guntersville Reservoir.

11.2.3.3 Dilution Factor

Add the following information at the end of DCD Subsection 11.2.3.3.

BLN COL 11.2-2 The dilution factors used for the maximum exposed individual and the population dose are calculated by the LADTAP II code in accordance with Regulatory Guide 1.113. This LADTAP option requires information on whether the discharge is into a river or a lake, the average flow velocity (ft/s), the average depth of the river/lake, the distance from the discharge point to the usage location, the offshore distance to the water usage location, and the width of the river or depth of the discharge point for a lake. Except for the distance downstream of the BLN discharge, all the inputs used for LADTAP II to calculate a dilution factor are the same for every point.

The average flow rate of the Tennessee River is 38,850 ft^3/s. With an average width of 3,400 ft and an average depth of 15 ft for the Guntersville Reservoir, the average flow velocity is 0.76 ft/s. For points beyond the Guntersville Dam, the minimum depth of the Tennessee River, 11 ft is used for calculating an average flow velocity of 1.04 ft/s. An offshore distance to the water usage location of zero is conservatively used, and the depth of the discharge is 27 ft. An offshore distance of zero is conservative because the closest water use is on the opposite side of the reservoir. The distance used to calculate the dilution factor for the nearest fish and swimming location is assumed to be 300 ft, while the distance to the nearest drinking water intake is 4.5 miles (23,760 ft).

The dilution factors and a summary of parameters used to calculate them are presented in Table 11.2-201.

11.2.3.5 Estimated Doses

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

BLN COL 11.2-2 Dose and dose rate to man was calculated using the LADTAP II computer code. This code is based on the methodology presented in Regulatory Guide 1.109.
BLN COL 11.5-3 Factors common to both estimated individual dose rates and estimated population dose are addressed here. Unique data are discussed in the respective sections.

Activity pathways considered are drinking water, sport fishing, commercial fishing, and recreational activities.

The nearest drinking water takeoff downstream of the BLN is approximately four and a half miles on the far shore. This location is used for the nearest drinking water extraction point. No irrigation of crops or pastureland has been identified downstream of the BLN plant. Consequently, this pathway is not evaluated.

11.2.3.5.1 Estimated Individual Dose Rate

Dose rates to individuals are calculated for drinking water, fish consumption, and recreational activities.

Table 11.2-202 contains LADTAP II input data for dose rate calculations. Table 11.2-203 gives the maximum individual dose rates.

The maximum doses to individuals resulting from routine liquid effluents per unit are given in Table 11.2-203. These doses are multiplied by two (2) to account for both units at the site. The total maximum doses for both units are summarized in Table 11.2-205 for comparison to the regulatory limits set forth in 40 CFR Part 190.

The annual doses to a maximally exposed individual from gaseous effluents are given in Table 11.3-207. The total site dose compared with the 40 CFR Part 190 criteria is provided in Table 11.2-206. The liquid effluent doses per unit presented in Table 11.2-203 are added to the gaseous effluent doses per unit presented in Table 11.3-203. The resulting maximum doses to total body, thyroid, and to any organ are multiplied by two (2) to account for both units. These results are presented in FSAR Table 11.2-206. The radiation exposure at the site boundary was considered in DCD Subsection 12.4.2. Direct radiation from containment and other plant buildings is negligible for the values in Table 11.2-206. Additionally, there is no contribution from refueling water because the refueling water is stored inside the containment instead of in an outside storage tank. In addition, there is no outside storage of solid radwaste. There are no radiation sources outside of the permanent plant structures. There are no other uranium fuel cycle facilities in the vicinity of the site that would contribute to the dose received by the maximally exposed individual. Thus, only the dose from effluent released from the site and direct radiation from the site need be considered.

11.2.3.5.2 Estimated Population Dose

The population dose is based on the fraction of the 50-mile population that will be exposed to the evaluated pathways. These pathways are drinking water, recreational activities, and fishing (both sport and commercial).

Guntersville Lake is a sport fishing resort. Sport fishing harvest is estimated using data from the State of Alabama. The sport fishing harvest is estimated to be 309,134 kg/yr. The commercial fishing harvest is estimated to be 761,931 kg/yr.

Recreational activities include swimming, boating, and shoreline use. The annual usage for each of these activities is assumed to be 2.3E+07 person-hours.

The population doses are given in Table 11.2-204.

11.2.3.5.3 Liquid Radwaste Cost Benefit Analysis Methodology

STD COL 11.2-2 The application of 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 (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 Regulatory Guide 1.110. It is assumed that the radwaste system for this analysis is a unitized system at a 2-unit site, which equals an ICF 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 LCCF of 1.0 (the lowest value) is assumed in this analysis.

Appendix I to 10 CFR Part 50 prescribes a $1,000 per person-rem criterion for determining the cost benefit of actions to reduce radiation exposure.

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 liquid radwaste treatment system augments annual costs were determined and the lowest annual cost considered a threshold value. The lowest-cost option for liquid radwaste treatment system augments is a 20 gpm Cartridge Filter at $11,140 per year, which yields a threshold value of 11.14 person-rem total body or thyroid dose from liquid effluents.

For AP1000 sites with population dose estimates less than 11.14 person-rem total body or thyroid dose from liquid effluents, no further cost-benefit analysis is needed to demonstrate compliance with 10 CFR 50, Appendix I Section II.D.

11.2.3.5.4 Liquid Radwaste Cost Benefit Analysis

BLN COL 11.2-2 The population doses are given in Table 11.2-204. As discussed above, the lowest cost liquid radwaste system augment is $11,140. Assuming 100 percent efficiency of this augment, the minimum possible cost per person-rem is determined by dividing the cost of the augment by the population dose. This is $6,962 per person-rem total body ($11,140/1.60 person-rem) and $7,901 per person-rem thyroid ($11,140/1.41 person-rem). These costs per person-rem reduction exceed the $1,000 per person-rem criterion prescribed in Appendix I to 10 CFR Part 50 and are therefore not beneficial.

11.2.3.6 Quality Assurance

STD SUP 11.2-1 Add the following to the end of DCD Subsection 11.2.3.6:

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 liquid radwaste system is established by procedures that complies with the guidance presented in Regulatory Guide 1.143.

11.2.5 COMBINED LICENSE INFORMATION

11.2.5.1 Liquid Radwaste Processing by Mobile Equipment

STD COL 11.2-1 This COL Item is addressed in Subsection 11.2.1.2.5.2.

11.2.5.2 Cost Benefit Analysis of Population Doses

STD COL 11.2-2 This COL Item is addressed in Subsection 11.2.3.5.3.

BLN COL 11.2-2 This COL Item is addressed in Subsections 11.2.3.3, 11.2.3.5, 11.2.3.5.1, 11.2.3.5.2, and 11.2.3.5.4.

BLN COL 11.2-2

TABLE 11.2-201
DILUTION FACTOR PARAMETERS AND DILUTION FACTORS

Input Parameter	Average Annual Condition
Average Width of River (ft.)	3400
Average Depth of Guntersville Reservoir (ft)	15
Average Depth of River (ft.)	11
Stream Velocity in Guntersville Reservoir (ft./sec)	0.76
Stream Velocity of Tennessee River Below Guntersville Reservoir (ft./sec)	1.04
Distance from Near Shore for Source (ft.)	0
Distance to Drinking Water Extraction (mi.)	4.5
Average Distance to Recreational Activities (mi.)	21.25
Average Distance to Where Fish are Caught (mi.)	21.25
Dilution Factor for Drinking Water Beyond Guntersville Reservoir	2907
Downstream Distance Used to Determine the Dilution Factor for Sport Fishing (mi.)	21.25
Downstream Distance Used to Determine the Dilution Factor for Nearest Fish and Swimming Location (ft.)	300

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-202 (Sheet 1 of 2)
LADTAP II INPUT[a]

Input Parameter	Value
Freshwater Site	Selected
Discharge Flowrate (cfs)	13.37
50-mile Population	FSAR Tables 2.1-203 & 2.1-204
Source Term	DCD Table 11.2-7
Reconcentration Model	None
Shore Width Factor	0.3[b]
Dilution Factors	Table 11.2-201
Transit Time – Nearest Drinking Water (hr)	8.7
Transit Time – Midpoint of Guntersville Reservoir (hr)	41
Sport Fish Annual Harvest (kg/yr)	309,134
Commercial Fish Harvest (kg/yr)	761,931
Shoreline Usage (person-hrs/yr)	22,814,630
Swimming Exposure (person-hrs/yr)	22,814,630
Boating Exposure (person-hrs/yr)	22,814,630
Length of Guntersville Reservoir (mi.)	42.5
Discharge Depth (ft.)	27
Drinking water intakes downstream of BLN	
Scottsboro	
Distance (ft.)	30,096
Population	24,059
Guntersville	
Distance (ft.)	176,880
Population	7,647
Section & Dutton	
Distance (ft.)	50,160
Population	12,941
Fort Payne	
Distance (ft.)	23,760
Population	29,412
Albertville	
Distance (ft.)	161,040
Population	58,823

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-202 (Sheet 2 of 2)
LADTAP II INPUT[(a)]

Input Parameter	Value
Arab	
Distance (ft.)	187,440
Population	25,294
Huntsville	
Population	168,132

a) Input parameters not specified use default LADTAP II values.

b) The Tennessee River empties into the Guntersville Lake downstream of the plant. The shore width factor for a lake was selected for this reason.

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-203 (Sheet 1 of 2)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM LIQUID EFFLUENTS

(Per Unit)
Dose (mrem/yr)

Pathway	Total body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
				Adult				
Fish	1.88E-01	1.10E-02	1.27E-01	2.46E-01	8.24E-02	1.25E-02	2.81E-02	-
Drinking	1.75E-02	2.07E-02	7.65E-04	1.78E-02	1.71E-02	2.39E-02	1.67E-02	-
Shoreline	2.23E-04	2.23E-04	2.23E-04	2.23E-04	2.23E-04	2.23E-04	2.23E-04	2.61E-04
Total	2.06E-01	3.19E-02	1.28E-01	2.64E-01	9.97E-02	3.66E-02	4.50E-02	2.61E-04
				Teenager				
Fish	1.08E-01	8.39E-03	1.33E-01	2.51E-01	8.30E-02	1.14E-02	3.23E-02	-
Drinking	1.22E-02	1.47E-02	7.34E-04	1.28E-02	1.22E-02	1.80E-02	1.18E-02	-
Shoreline	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.24E-03	1.45E-03
Total	1.21E-01	2.43E-02	1.35E-01	2.65E-01	9.64E-02	3.07E-02	4.53E-02	1.45E-03
				Child				
Fish	4.21E-02	3.81E-03	1.64E-01	2.16E-01	6.94E-02	1.17E-02	2.53E-02	-
Drinking	2.29E-02	2.53E-02	2.10E-03	2.47E-02	2.34E-02	3.77E-02	2.27E-02	-
Shoreline	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04	2.60E-04	3.04E-04
Total	6.53E-02	2.94E-02	1.66E-01	2.41E-01	9.31E-02	4.96E-02	4.82E-02	3.04E-04

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-203 (Sheet 2 of 2)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM LIQUID EFFLUENTS

(Per Unit)
Dose (mrem/yr)

Pathway	Total body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
				Infant				
Fish	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-
Drinking	2.23E-02	2.39E-02	2.26E-03	2.48E-02	2.31E-02	4.60E-02	2.23E-02	-
Shoreline	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	2.23E-02	2.39E-02	2.26E-03	2.48E-02	2.31E-02	4.60E-02	2.23E-02	0.00E+00

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-204
ANNUAL POPULATION DOSE FROM LIQUID EFFLUENTS
(PER UNIT)

Dose (person-rem per yr.)

Pathway	Total body	GI-LLI	Bone	Liver	Kidney	Thyroid	Lung	Skin
Fish- Sport Harvest	3.44E-01	1.99E-02	3.01E-01	5.40E-01	1.79E-01	1.51E-02	6.29E-02	-
Fish- Commercial	2.01E-01	1.16E-02	1.76E-01	3.15E-01	1.05E-01	7.24E-03	3.67E-02	-
Drinking Water	9.70E-01	1.13E+00	5.39E-02	1.00E+00	9.60E-01	1.32E+00	9.34E-01	-
Hydrosphere Tritium	7.63E-03	7.63E-03	0.00E+00	7.63E-03	7.63E-03	7.63E-03	7.63E-03	-
Shoreline	5.54E-02	-	-	-	-	5.54E-02	-	6.48E-02
Swimming	6.08E-04	-	-	-	-	6.08E-04	-	-
Boating	3.04E-04	-	-	-	-	3.04E-04	-	-
Total	1.58E+00	1.17E+00	5.31E-01	1.86E+00	1.25E+00	1.41E+00	1.04E+00	6.48E-02

TABLE 11.2-205
LIQUID PATHWAY COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 40 CFR PART 190 LIMIT

Type of Dose (Annual)	Design Limit (1) (mrem/yr.)	Calculated Dose (2) (mrem/yr.)
Total Body Dose Equivalent (adult)	25	4.12E-01
Thyroid Dose (child)	75	9.92E-02
Dose to Any Other Organ (teenager liver)	25	5.30E-01

1) Source 40 CFR Part 190.

2) Total for two units.

TABLE 11.2-206
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 40 CFR PART 190 LIMIT

Type of Dose (Annual)	Design Limit [(1)] (mrem/yr.)	Calculated Dose [(2)] (mrem/yr.)
Total Body Dose Equivalent (child)	25	1.25
Thyroid Dose (infant)	75	18.6
Dose to Any Other Organ (child bone)	25	4.69

1) Source 40 CFR Part 190.

2) Total for two units. Includes effluent pathways and direct radiation sources for all units at the site. Direct radiation has been shown to be negligible per Subsection 11.2.3.5.1.

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

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

11.3.3 RADIOACTIVE RELEASES

STD SUP 11.3-2 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.

11.3.3.4 Estimated Doses

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

BLN COL 11.3-1
BLN COL 11.5-3 The calculated gaseous doses for the maximum exposed individual are compared to the regulatory limits from Appendix I of 10 CFR Part 50 and 10 CFR Part 20.1301 for acceptance. Tables 11.3-206 and 11.3-207 display this comparison and demonstrate that the calculated gaseous doses for the maximally exposed individual are less than the regulatory limits. The doses to individuals due to routine gaseous effluents are given in Table 11.3-207 for comparison to the regulatory limits set forth in 40 CFR Part 190. The contributing pathways are external exposure to airborne activity in the plume, external exposure to deposited activity on the ground, inhalation of airborne activity in the plume, and ingestion of contaminated agricultural products including meat, milk, and vegetables (including grains).

Dose and dose rate to man was calculated using the GASPAR II computer code. This code is based on the methodology presented in Regulatory Guide 1.109. Factors common to both estimated individual dose rates and estimated population dose are addressed in this subsection. Unique data are discussed in the respective subsections. Activity pathways considered are plume, ground deposition, inhalation, and ingestion of vegetables, meat, and milk (both cow and goat).

Agricultural products are estimated from U.S. Department of Agriculture (USDA) National Agricultural Statistics Service. GASPAR II evenly distributes the food production over the entire 50 mi. when given a total production for calculating dose.

Population distribution within the 50-mi. radius is presented in FSAR Tables 2.1-203 and 2.1-204.

11.3.3.4.1 Estimated Individual Doses

Dose rates to individuals are calculated for airborne decay and deposition, inhalation, and ingestion of milk (cow and goat), meat and vegetables. Dose from plume and ground deposition are calculated as affecting all age groups equally.

Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest man, milk animal, garden, and school is located in Section 2.3.

Table 11.3-203 summarizes the doses to the maximum exposed individual for each pathway and age group. These doses are per unit doses for either Unit 3 or Unit 4. The doses due to immersion in the plume are calculated at the point of maximum exposure outside of the site boundary, 1.74 mi. south of the plant. Doses from all other pathways are conservatively calculated at the maximum receptor, a garden 1.13 mi. southwest of the plant. The total doses shown in Table 11.3-203 conservatively include the doses from the goat milk pathway instead of the cow milk pathway. The evaluation assumed that the maximally exposed individual drinks their entire assumed milk consumption from a goat living at the worst-case receptor. This is conservative because there is not a large number of milk goats within 5 mi. of the Bellefonte site and goat milk produces higher doses than cow milk. The doses shown in Table 11.3-203 for the cow milk pathway are included for information only. The doses are below the 10 CFR Part 50, Appendix I design objectives of 5 mrem/yr to total body, and 15 mrem/yr to any organ, including skin.

11.3.3.4.2 Estimated Population Dose

The population dose analysis performed to determine offsite dose from gaseous effluents is based upon the AP1000 generic site parameters included in DCD Chapter 11 and Tables 11.3-1, 11.3-2 and 11.3-4 and population data in Table 11.3-202. The population dose is shown in Table 11.3-205. The population dose summary in Table 11.3-205 results in a total effective dose equivalent (TEDE) of 3.19 person-rem. For comparison to 10 CFR Part 20.1301, the TEDE was calculated by adding 3 percent of the thyroid dose to the total body dose. This methodology is recommended by the NRC in Regulatory Guide 1.183 for comparing dose results expressed in terms of total body and thyroid with results expressed in terms of TEDE.

11.3.3.4.3 Gaseous Radwaste Cost-Benefit Analysis Methodology

STD COL 11.3-1 The guidance for performing cost-benefit analysis for the gaseous radwaste system is similar to that used and described for the liquid radwaste system in

Section 11.2. The gaseous radwaste treatment system augments 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 $6,320 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 50, Appendix I, Section II.D.

11.3.3.4.4 Gaseous Radwaste Cost-Benefit Analysis

BLN COL 11.3-1 The population doses are given in Table 11.3-205. The lowest cost gaseous radwaste system augment is $6,320. Assuming 100 percent efficiency of this augment, the minimum possible cost per person-rem is determined by dividing the cost of the augment by the population dose. This is $2,107 per person-rem total body ($6,320/3.0 person-rem) and $1,003 ($6,320/6.3person-rem) per person-rem thyroid. These costs per person-rem reduction exceed the $1,000 per person-rem criterion prescribed in Appendix I to 10 CFR Part 50 and are therefore not cost beneficial. Realistic efficiencies would increase the cost per person-rem further above the $1,000 criterion.

11.3.3.6 Quality Assurance

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.

11.3.5 COMBINED LICENSE INFORMATION

11.3.5.1 Cost Benefit Analysis of Population Doses

STD COL 11.3-1 This COL Item is addressed in Subsections 11.3.3.4.3

BLN COL 11.3-1 This COL Item is addressed in Subsections 11.3.3.4, 11.3.3.4.1, 11.3.3.4.2, and 11.3.3.4.3.

BLN COL 11.5-3 This COL Item is addressed in Subsection 11.3.3.4.

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-201
GASPAR II INPUT[1]

Input Parameter	Value
Number of Source Terms	1
Read Met data from XOQDOQ-generated file	Selected
Distance from site to NE Corner of the US (mi.)	1,262
Source Term	DCD Table 11.3-3
Population Data	Table 11.3-202
Fraction of the year leafy vegetables are grown	0.42
Fraction of the year milk cows are on pasture	0.67
Fraction of max individual’s vegetable intake from own garden	0.76
Fraction of milk-cow feed intake from pasture while on pasture	1
Fraction of the year goats are on pasture	0.75
Fraction of goat feed intake from pasture while on pasture	1
Fraction of the year beef cattle are on pasture	0.67
Fraction of beef-cattle feed intake from pasture while on pasture	1
Total Production Rate for the 50-mile area	
-Vegetables (kg/yr)	144,009,482
-Milk (L/yr)	61,128,558
-Meat (kg/yr)	20,644,713

1) Input parameters not specified use default GASPAR II values.

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-202
2027 POPULATION INPUT FOR POPULATION DOSE COMPUTATIONS

	Distance (mi)									
Direction	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	5	58	77	52	21	266	574	4765	9177	6981
NNE	0	47	117	173	183	825	6419	7783	8151	11,697
NE	0	30	33	17	28	254	6887	9524	29,319	91,976
ENE	0	3	9	16	26	214	5902	16,297	79,290	250,397
E	0	5	25	77	175	1463	4264	8575	13,575	17,399
ESE	0	5	20	97	302	1566	5218	12,458	18,212	13,543
SE	0	4	11	20	34	1301	10,948	10,537	8973	19,181
SSE	0	4	9	19	44	866	11,572	12,556	10,824	15,461
S	0	1	4	29	103	2103	6340	9632	19,713	47,054
SSW	0	0	10	191	723	861	3529	18,894	38,054	34,127
SW	0	3	51	160	337	5524	5964	12,583	21,301	29,876
WSW	0	24	94	293	737	13,759	2920	9515	16,780	16,889
W	5	51	135	207	198	707	2088	40,264	111,023	187,497
WNW	20	75	157	242	284	447	1397	8045	20,143	34,014
NW	13	56	58	32	27	198	1056	3273	7893	15,181
NNW	12	58	57	22	12	257	368	6910	20,169	37,006
Totals	55	424	867	1647	3234	30,611	75,446	192,611	432,597	828,279

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-203 (Sheet 1 of 4)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (PER UNIT)

	Dose (mrem/yr)							
Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Adult Age Group								
Plume	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.72E-01	9.57E-01
Ground	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.93E-02
Vegetable	6.17E-02	6.34E-02	3.60E-01	6.18E-02	5.77E-02	8.66E-01	5.15E-02	5.06E-02
Meat	1.93E-02	2.39E-02	8.80E-02	1.94E-02	1.89E-02	4.87E-02	1.85E-02	1.84E-02
Cow Milk(1)	2.83E-02	2.34E-02	1.06E-01	3.11E-02	2.85E-02	8.76E-01	2.24E-02	2.17E-02
Goat Milk	4.26E-02	2.69E-02	1.24E-01	4.96E-02	3.81E-02	1.17E+00	2.72E-02	2.48E-02
Inhalation	9.04E-03	9.15E-03	1.42E-03	9.25E-03	9.41E-03	8.50E-02	1.18E-02	8.77E-03
Total	3.33E-01	3.23E-01	7.73E-01	3.40E-01	3.24E-01	2.37E+00	3.23E-01	1.11E+00

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-203 (Sheet 2 of 4)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (PER UNIT)

	Dose (mrem/yr)							
Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Teenage Age Group								
Plume	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.72E-01	9.57E-01
Ground	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.93E-02
Vegetable	9.35E-02	9.55E-02	5.63E-01	9.86E-02	9.20E-02	1.19E+00	8.27E-02	8.10E-02
Meat	1.57E-02	1.83E-02	7.40E-02	1.60E-02	1.56E-02	3.71E-02	1.53E-02	1.52E-02
Cow Milk(1)	4.58E-02	4.05E-02	1.94E-01	5.48E-02	5.04E-02	1.39E+00	3.98E-02	3.84E-02
Goat Milk	6.11E-02	4.52E-02	2.24E-01	8.58E-02	6.57E-02	1.86E+00	4.72E-02	4.25E-02
Inhalation	9.15E-03	9.24E-03	1.73E-03	9.50E-03	9.73E-03	1.06E-01	1.34E-02	8.85E-03
Total	3.79E-01	3.68E-01	1.06E+00	4.10E-01	3.83E-01	3.39E+00	3.73E-01	1.15E+00

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-203 (Sheet 3 of 4)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (PER UNIT)

Dose (mrem/yr)

Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Child Age Group								
Plume	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.72E-01	9.57E-01
Ground	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.93E-02
Vegetable	2.07E-01	1.99E-01	1.30E+00	2.18E-01	2.07E-01	2.33E+00	1.91E-01	1.89E-01
Meat	2.86E-02	2.98E-02	1.39E-01	2.91E-02	2.86E-02	6.12E-02	2.82E-02	2.81E-02
Cow Milk(1)	9.96E-02	9.25E-02	4.72E-01	1.19E-01	1.11E-01	2.78E+00	9.31E-02	9.09E-02
Goat Milk	1.16E-01	9.96E-02	5.39E-01	1.70E-01	1.35E-01	3.71E+00	1.04E-01	9.74E-02
Inhalation	8.10E-03	7.99E-03	2.09E-03	8.45E-03	8.64E-03	1.24E-01	1.16E-02	7.81E-03
Total	5.60E-01	5.36E-01	2.18E+00	6.26E-01	5.79E-01	6.43E+00	5.49E-01	1.33E+00

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-203 (Sheet 4 of 4)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (PER UNIT)

Dose (mrem/yr)

Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Infant Age Group								
Plume	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.58E-01	1.72E-01	9.57E-01
Ground	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.20E-02	4.93E-02
Vegetable	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Meat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cow Milk(1)	1.99E-01	1.88E-01	9.00E-01	2.44E-01	2.20E-01	6.71E+00	1.90E-01	1.86E-01
Goat Milk	2.19E-01	1.98E-01	9.98E-01	3.41E-01	2.59E-01	8.96E+00	2.09E-01	1.96E-01
Inhalation	4.68E-03	4.56E-03	1.05E-03	5.05E-03	5.03E-03	1.11E-01	7.10E-03	4.49E-03
Total	4.24E-01	4.03E-01	1.20E+00	5.46E-01	4.64E-01	9.27E+00	4.30E-01	1.21E+00

1) The doses shown for the cow milk pathway are included for information only. They are not included in the total doses, because the evaluation assumed that the maximally exposed individual drinks their entire assumed milk consumption from a goat living at the worst-case receptor. See Subsection 11.3.3.4 for further discussion.

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-204
CALCULATED MAXIMUM INDIVIDUAL DOSES COMPARED TO
10 CFR PART 50 APPENDIX I LIMITS

Description	Limit	Calculated Values
Noble Gasses[1]		
Gamma Dose (mrad)	10	2.65E-01
Beta Dose (mrad)	20	1.39E+00
Total Body Dose (mrem)	5	1.58E-01
Skin Dose (mrem)	15	9.57E-01
Radioiodines and Particulates		
Total Body Dose (mrem)	-	4.02E-01
Max to Any Organ (mrem)[2]	15	9.11E+00

1) Doses due to noble gases in the released plume are calculated at the location of maximum dose at or beyond the site boundary (location of highest X/Q and D/Q values). This location is 1.74 miles south of the plant.

2) The maximum dose to any organ is the dose to the thyroid of an infant. This dose is calculated at the receptor location with the highest X/Q values, which is a garden 1.13 miles southwest of the plant.

BLN COL 11.3-1

BLN COL 11.5-3

TABLE 11.3-205
POPULATION DOSES

(person-rem)

Pathway	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Plume	1.04E+00	1.04E+00	1.04E+00	1.04E+00	1.04E+00	1.04E+00	1.23E+00	1.22E+01
Ground	1.35E-01	1.35E-01	1.35E-01	1.35E-01	1.35E-01	1.35E-01	1.35E-01	1.58E-01
Inhalation	3.56E-01	3.58E-01	5.10E-02	3.62E-01	3.64E-01	2.55E+00	4.64E-01	3.48E-01
Vegetable	1.02E+00	1.02E+00	4.77E+00	1.02E+00	1.01E+00	1.03E+00	1.00E+00	1.00E+00
Cow Milk	2.82E-01	2.77E-01	1.27E+00	2.89E-01	284E-01	1.34E+00	2.77E-01	2.75E-01
Meat	1.64E-01	1.69E-01	7.72E-01	1.65E-01	1.64E-01	1.98E-01	1.64E-01	1.63E-01
Total	3.00E+00	3.00E+00	8.03E+00	3.01E+00	3.00E+00	6.30E+00	3.27E+00	1.41E+01

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-206
MAXIMUM INDIVIDUAL DOSES FROM BOTH UNITS DUE TO ROUTINE GASEOUS EFFLUENTS COMPARED TO 10 CFR 20.1301 LIMITS

Description	Limit	Calculated Values
TEDE (mrem)	100	1.50E+00
Maximum Dose per Hour (mrem/hr)	2	1.72E-04

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-207
COLLECTIVE GASEOUS DOSES COMPARED TO
40 CFR PART 190 LIMITS

Description	Limit	Calculated Values for Both Units
Total Body Dose Equivalent (mrem)	25	1.12E+00
Thyroid Dose (mrem)	75	1.85E+01
Max to Any Other Organ (mrem)(1)	25	4.36E+00

1) Note that the maximum dose to any organ other than the thyroid is the dose to the bone of a child.

11.4 SOLID WASTE MANAGEMENT

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

Add the following after DCD Subsection 11.4.2.4.2:

11.4.2.4.3 Alternatives for B and C Wastes

BLN COL 11.4-1 It is expected that Class B and C wastes will constitute approximately 5 percent by volume of the low level radioactive waste that will be generated by the plant with the balance being Class A waste. The volume of wet Class B and C waste is approximately 100 percent of the total Class B and C waste. As of July 1, 2008, the low level radioactive waste disposal facility in Barnwell, South Carolina is no longer accepting Class B and C waste from sources in states that are outside of the Atlantic Compact. However, the disposal facility in Clive, Utah is still accepting Class A waste from out of state.

Should there be no disposal facilities that will accept the Class B and C wastes after the plant begins operation, there are several options available for storage of such waste:

- As provided in referenced DCD Subsection 11.4.2, the Auxiliary Building is designed to have more than a year of spent resin storage capacity at the expected rate and the spent resin tanks may be mixed to limit the radioactivity concentrations thereby limiting the volume of Class B and C wet waste requiring storage.

- Vendor services are available to process Class A, B, and C waste and transfer for storage that material until a disposal site is available. Currently, Waste Control Specialists of Texas is available to store Class A, B, and C material pending the availability of a licensed disposal site.

- If additional storage capacity were eventually needed, the plant could construct or expand storage facilities onsite or gain access to a storage facility at another licensed nuclear plant.

11.4.5 QUALITY ASSURANCE

Add the following 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.

11.4.6 COMBINED LICENSE INFORMATION FOR SOLID WASTE MANAGEMENT SYSTEM PROCESS CONTROL PROGRAM

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.

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

Table 13.4-201 provides milestones for PCP implementation.

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.

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.

11.5 RADIATION MONITORING

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

11.5.1.2 Power Generation Design Basis

Revise the fourth bullet in DCD Subsection 11.5.1.2 as follows:

STD 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 1.

11.5.2.4 Inservice Inspection, Calibration, and Maintenance

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.

11.5.3 EFFLUENT MONITORING AND SAMPLING

Add the following information at the end of DCD Subsection 11.5.3.

BLN COL 11.5-2 TVA is extending the existing TVA program for quality assurance of radiological effluent and environmental monitoring that is based on Regulatory Guide 4.15, Revision 1, to apply to Bellefonte Units 3 and 4. Regulatory Guide 4.15, Revision 1, is a proven methodology for quality assurance of radiological effluent and environmental monitoring programs that is acceptable to the NRC staff as a method for demonstrating compliance with applicable requirements of 10 CFR Parts 20, 50, 52, 61, and 72. Use of Revision 2 of Regulatory Guide 4.15 would necessitate conducting two separate programs involving the use of common staff, facilities and equipment, which will create an undue burden and may lead to an increased possibility for human error. Therefore, TVA commits to use Regulatory Guide 4.15, Revision 1, methodology for Bellefonte Units 3 and 4 for optimal consistency, efficiency and practicality.

11.5.4 PROCESS AND AIRBORNE MONITORING AND SAMPLING

STD COL 11.5-2 Add the following information at the end of the first paragraph in DCD Subsection 11.5.4.

The sampling program for liquid and gaseous effluents will conform to Regulatory Guide 4.15, Revision 1 (See Appendix 1AA).

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 streams or 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 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 in accordance with 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:

- 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.

11.5.6.5 Quality Assurance

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

STD COL 11.5-2 The sampling program and the associated monitors conform to Regulatory Guide 4.15, Revision 1 (See Appendix 1AA).

11.5.7 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 11.5.1.2, 11.5.2.4, 11.5.4, 11.5.4.1, 11.5.4.2, and 11.5.6.5.

BLN COL 11.5-2 This COL item is addressed in Subsection 11.5.3.

BLN COL 11.5-3 This COL Item is addressed in Subsections 11.2.3.5, 11.2.3.5.1 for liquid effluents and 11.3.3.4 for gaseous effluents.

Add the following subsection after DCD Subsection 11.5.7.

11.5.8 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."

STD COL 11.5-2

TABLE 11.5-201 (Sheet 1 of 2)
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.

STD COL 11.5-2

TABLE 11.5-201 (Sheet 2 of 2)
MINIMUM SAMPLING FREQUENCY

Stream	Sampled Medium	Frequency
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.

STD COL 11.5-2

TABLE 11.5-202
MINIMUM SENSITIVITIES

Stream	Nuclide	Sensitivity
Gaseous	Fission & Activation Gases	1.0E-04 μCi/cc
	Tritium	1.0E-06 μCi/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 μCi/ml
	Gamma-emitters	5.0E-07 μCi/ml
	Dissolved & Entrained Gases	1.0E-05 μCi/ml
	Gross Alpha	1.0E-07 μCi/ml
	Tritium	1.0E-05 μCi/ml
	Sr-89 & Sr-90	5.0E-08 μCi/ml
	Fe-55	1.0E-06 μCi/ml