CHAPTER 11

RADIOACTIVE WASTE MANAGEMENT

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

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.

11.2.1.2.5.2 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 mobile or temporary equipment may be installed in the Radwaste Building. When the A_2 quantities are exceeded, liquid effluent is processed in the Seismic Category I auxiliary building.

Mobile or temporary equipment is designed in accordance with the codes and standards listed in Table 1 and Regulatory Position C.1.1.2 of Regulatory Guide 1.143.

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 an Operator 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.

11.2.3.3 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.

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 2.9E+08 person-hours.

The population doses are given in Table 11.2-204,

This section adopts NEI 07-11 (Reference 201) which is currently under review by the NRC staff. The application of the methodology of NEI 07-11 satisfies the cost-benefit analysis requirements of 10 CFR Part 50, Appendix I, Section II.D. The augments provided in NEI 07-11 were reviewed and were found not to be cost beneficial due to the low BLN population doses.

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

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, and 11.2.3.5.2.

11.2.6 REFERENCES

201. NEI 07-11, “Generic FSAR Template Guidelines for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors,” Revision 0, September 2007.

TABLE 11.2-201

BLN COL 11.2-2 DILUTION FACTOR PARAMETERS AND DILUTION FACTORS

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

BLN COL 11.2-2
BLN COL 11.5-3

TABLE 11.2-202
LADTAP II INPUT[a] FOR INDIVIDUAL DOSE RATES

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)	292,027,269
Swimming Exposure (person-hrs/yr)	292,027,269
Boating Exposure (person-hrs/yr)	292,027,269
Length of Guntersville Reservoir (mi.)	42.5

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
INDIVIDUAL DOSE RATES

	Dose (mrem/yr)			
Annual Dose Total Body[a]	Maximum Organ[b] (Liver)	Maximum Thyroid Dose[c]	TEDE Dose	Dose Limit[d]
2.06E-01	2.65E-01	4.96E-02	2.07E-1	Total Body: 3 Any organ: 10

a) an adult was found to receive the maximum individual total body dose

b) a teenager was found to receive the maximum individual organ dose

c) a child was found to receive the maximum individual thyroid dose

d) 10 CFR 50 Appendix I

BLN COL 11.2-2

TABLE 11.2-204
POPULATION DOSES

	Annual Dose (person-rem)
Total Body	1.60
Liver (Max. organ)	1.90
Thyroid	1.41

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

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

11.3.3.4 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 BLN site-specific values are bounded by the DCD identified acceptable releases. With the annual airborne releases listed in DCD Table 11.3-3, the site specific air doses at ground level at the site boundary are 0.172 mrad for gamma radiation and 0.722 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.

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).

Based on site meteorological conditions, the highest rate of plume exposure and ground deposition occurs at the exclusion area boundary (EAB) 0.77 mi. NNE of the plant.

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 miles 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.

Plume exposure approximately 0.77 mi. NNE of the BLN produced a maximum dose rate to a single organ of 5.28E-1 mrem/yr to skin. The maximum total body dose rate was calculated to be 1.05E-1 mrem/.yr.

Ground deposition approximately 0.77 mi. NNE of the BLN produced a maximum dose rate to a single organ of 1.23E-1 mrem/yr to skin. The maximum total body dose rate was calculated to be 1.05E-1 mrem/yr.

Inhalation dose at the EAB, 0.77 mi. NNE of the BLN, results in a maximum dose rate to a single organ of 1.59E-1 mrem/yr to a child's thyroid. The maximum total body dose rate is calculated to be 1.16E-2 mrem/yr to a teenager.

Vegetable consumption assumes that the dose is received from gardens, approximately 1.3 mi. NNE of the BLN and 4.1 mi NE of the plant. GASPAR II default vegetable consumption values are used in lieu of site-specific vegetable consumption data as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 2.12 mrem/yr to a child's thyroid. The maximum total body dose rate is calculated to be 1.69E-1 mrem/yr to a child.

Meat consumption assumes that the dose is received from an animal, approximately 4.1 mi. NE of the BLN. Milk and meat animals are assumed to be co-located. GASPAR II default meat consumption values are used in lieu of site-specific meat consumption data as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 1.12E-1 mrem/yr to a child's bone. The maximum total body dose rate is calculated to be 2.37E-2 mrem/yr to a child.

Cow milk consumption assumes that the dose is received from an animal, approximately 4.1 mi. NE of the BLN. GASPAR II default cow milk consumption values are used in lieu of site-specific cow milk consumption data as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 1.28 mrem/yr to an infant's thyroid. The maximum total body dose rate is calculated to be 1.61E-1 mrem/yr to an infant.

Goat milk consumption assumes that the dose is received from an animal, approximately 4.1 mi. NE of BLN. GASPAR II default goat milk consumption values are used in lieu of site-specific goat milk consumption data as permitted by Regulatory Guide 1.109. The estimated maximum dose rate to a single organ is 1.66 mrem/yr to an infant's thyroid. The maximum total body dose rate is calculated to be 1.77E-1 mrem/yr to an infant.

The maximum dose rate to any organ considering every pathway is calculated to be 3.76 mrem/yr to a child's thyroid. The maximum total body dose rate is calculated to be 5.84E-1 mrem/yr to a child. These 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.

Table 11.3-201 contains GASPAR II input data for dose rate calculations. Information regarding the locations for the nearest man, milk animal, garden, school, and the EAB is located in Section 2.3. Table 11.3-203 contains total organ dose rates based on age group. Table 11.3-204 contains total air dose at each special location.

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.

This section adopts NEI 07-11 (Reference 201) which is currently under review by the NRC staff. The application of the methodology of NEI 07-11 satisfies the cost-benefit analysis requirements of 10 CFR Part 50, Appendix I, Section II.D. The augments provided in NEI 07-11 were reviewed and were found not to be cost beneficial due to the low BLN population doses.

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

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

11.3.6 REFERENCES

201. NEI 07-11, “Generic FSAR Template Guidelines for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors,” Revision 0, September 2007.

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-201
GASPAR II INPUT(1) FOR DOSE RATES

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.)	1093
Source Term	DCD Table 11.3-3
Population Data	Table 11.3-202
Fraction of the year leafy vegetables are grown	0.58
Fraction of the year milk cows are on pasture	0.75
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	0.83
Fraction of goat feed intake from pasture while on pasture	1
Fraction of the year beef cattle are on pasture	0.75
Fraction of beef-cattle feed intake from pasture while on pasture	1
Total Production Rate for the 50-mile area	
-Vegetables (kg/yr)	387,856,026
-Milk (L/yr)	62,862,273
-Meat (kg/yr)	851,401,867
Special Location Data	Section 2.3

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

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-202
POPULATION INPUT FOR POPULATION DOSE RATES

	Distance (mi)									
Direction	1	2	3	4	5	10	20	30	40	50
N	5	70	92	63	25	319	683	4878	9564	8117
NNE	1	57	140	207	220	986	6934	8831	9867	13579
NE	0	36	39	21	34	298	6579	10374	30921	87929
ENE	0	4	10	19	31	258	7550	19967	98662	304878
E	0	6	30	92	210	1753	5683	10852	16745	21017
ESE	0	6	23	115	360	1877	6992	16232	23042	15238
SE	0	5	13	24	41	1569	13812	13498	11105	21058
SSE	0	5	11	23	53	1045	15451	16431	13904	20116
S	0	2	5	35	124	2521	8434	12743	22563	45905
SSW	0	0	12	48	114	1032	4453	26023	46798	29995
SW	0	4	62	192	403	6612	7151	15533	27254	38567
WSW	0	29	112	351	882	8775	3142	11315	20469	19845
W	6	60	161	248	237	847	2503	45466	121493	189605
WNW	24	89	188	289	339	535	1673	9949	24774	39853
NW	16	68	70	38	32	237	1264	3858	9204	16997
NNW	14	69	68	26	15	308	438	8133	22784	38222

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-203
INDIVIDUAL DOSE RATES(1)

	Dose (mrem/yr)							
Age Group	Total Body	GI-Tract	Bone	Liver	Kidney	Thyroid	Lung	Skin
Adult	3.38E-01	3.37E-01	7.34E-01	3.40E-01	3.34E-01	1.55E+00	3.40E-01	7.70E-01
Teenager	3.89E-01	3.88E-01	1.01E+00	3.99E-01	3.90E-01	2.08E+00	3.96E-01	8.22E-01
Child	5.84E-01	5.79E-01	2.06E+00	5.99E-01	5.90E-01	3.76E+00	5.89E-01	1.02E+00
Infant	5.54E+01	5.48E-01	1.61E+00	5.81E-01	5.63E-01	3.29E+00	5.60E-01	9.89E-01

1) Dose rates represent the summation of dose rates from each pathway.

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-204
DOSE IN MILLIRADS AT SPECIAL LOCATIONS

Special Location	Beta Air Dose	Gamma Air Dose
Animal	4.42E-01	7.80E-02
EAB	7.22E-01	1.72E-01
Garden 1	4.01E-01	8.62E-02
Cow/Goat	4.42E-01	7.80E-02
Garden 2	4.42E-01	7.80E-02

BLN COL 11.3-1
BLN COL 11.5-3

TABLE 11.3-205
POPULATION DOSES

	Whole Body (person-rem)	Thyroid (person-rem)
Population Dose	5.93	9.86

11.4 SOLID WASTE MANAGEMENT

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

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 This section adopts NEI 07-10 (Reference 201) which is currently under review by the NRC staff. 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

201. NEI 07-10, “Generic FSAR Template Guidance for Process Control Program (PCP) Description,” Revision 1, October 2007.

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

Add the following information after the fourth bullet in DCD Subsection 11.5.1.2.

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 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 subsections after 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

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.

For obtaining representative samples in unfiltered ducts, isokinetic probes are 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:

- 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 This section adopts NEI 07-09, (Reference 202) which is currently under review by NRC staff. The ODCM program description contains the methodology and parameters used for calculating doses resulting from liquid and gaseous effluents. The ODCM program description 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 program description 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 program description 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.

STD 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.

Add the following subsection after DCD Subsection 11.5.7.

11.5.8 REFERENCES

201. ANSI N13.1-1999, “Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities.”

202. NEI 07-09, “Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description,” Revision 0, September 2007.

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, Sr-90, and Fe-55. 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