Calvert Cliffs Nuclear Power Plant

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

Constellation Energy
Nuclear Generation Group

July 26, 2010

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant; Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Independent Spent Fuel Storage Installation, Docket No. 72-8
2009 Radioactive Effluent Release Report

REFERENCES: (a) Calvert Cliffs Unit Nos. 1 and 2 Technical Specification 5.6.3

(b) Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specification 6.3

As required by References (a) and (b), Enclosure (1) is provided. Meteorological data is kept in our onsite file and is available upon request.

Should you have questions regarding this matter, please contact Mr. Douglas E. Lauver at (410) 495-5219.

Very truly yours,

Pat Fri

for
Douglas E. Lauver
Director – Licensing

DEL/RDW/bjd

Enclosure: (1) Calvert Cliffs Nuclear Power Plant Effluent and Waste Disposal 2009 Annual Report

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ENCLOSURE (1)

CALVERT CLIFFS NUCLEAR POWER PLANT

EFFLUENT AND WASTE DISPOSAL

2009 ANNUAL REPORT

Calvert Cliffs Nuclear Power Plant, LLC
July 26, 2010

ENCLOSURE (1)

CALVERT CLIFFS NUCLEAR POWER PLANT
EFFLUENT AND WASTE DISPOSAL 2009 ANNUAL REPORT

Facility - Calvert Cliffs Nuclear Power Plant

Licensee – Calvert Cliffs Nuclear Power Plant, LLC

I. REGULATORY LIMITS

A. Fission and Activation Gases

1. The instantaneous release rate of noble gases in gaseous effluents shall not result in a site boundary dose rate greater than 500 mRem/year to the whole body or greater than 3000 mRem/year to the skin (Offsite Dose Calculation Manual (ODCM) 3.11.2.1).

2. Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce gaseous emissions when the calculated gamma-air dose due to gaseous effluents exceeds 1.20 mRad or the calculated beta-air dose due to gaseous effluents exceeds 2.4 mRad at the site boundary in a 92 day period (ODCM 3.11.2.4).

3. The air dose at the site boundary due to noble gases released in gaseous effluents shall not exceed (ODCM 3.11.2.2):

   10 mRad/qtr, gamma-air
   20 mRad/qtr, beta-air
   20 mRad/year, gamma-air
   40 mRad/year, beta-air

4. All of the above parameters are calculated according to the methodology specified in the ODCM.

B. Iodines and Particulates with Half Lives Greater than Eight Days

1. The instantaneous release rate of iodines and particulates in gaseous effluents shall not result in a site boundary dose-rate in excess of 1500 mRem/year to any organ (ODCM 3.11.2.1).

2. The Gaseous Radwaste Treatment System and the Ventilation Exhaust Treatment System shall be used to reduce radioactive materials in gaseous effluents when calculated doses exceed 1.8 mRem to any organ in a 92 day period at or beyond the site boundary (ODCM 3.11.2.4).

3. The dose to a member of the public at or beyond the site boundary from iodine-131 and particulates with half lives greater than eight days in gaseous effluents shall not exceed (ODCM 3.11.2.3):

   15 mRem/qtr, any organ
   30 mRem/year, any organ
   less than 0.1% of the above limits as a result of burning contaminated oil.

4. All of the above parameters are calculated according to the methodology specified in the ODCM.

C. Liquid Effluents

1. The concentrations of radionuclides in liquid effluents from the plant shall not exceed the values specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for unrestricted areas (ODCM 3.11.1.1).

2. The liquid radwaste treatment system shall be used to reduce the concentration of radionuclides in liquid effluents from the plant when the calculated dose to unrestricted areas exceeds 0.36 mRem to the whole body, or 1.20 mRem to any organ in a 92 day period (ODCM 3.11.1.3).

3. The dose to a member of the public in unrestricted areas shall not exceed (ODCM 3.11.1.2):

   3 mRem/qtr, total body
   10 mRem/qtr, any organ
   6 mRem/year, total body
   20 mRem/year, any organ

4. All of the liquid dose parameters are calculated according to the methodology specified in the ODCM.

II. MAXIMUM PERMISSIBLE CONCENTRATIONS

A. Fission and Activation Gases

Prior to the batch release of gaseous effluents, a sample of the source is collected and analyzed by gamma spectroscopy for the principal gamma emitting radionuclides. The identified radionuclide concentrations are evaluated and an acceptable release rate is determined to ensure that the dose rate limits of ODCM 3.11.2.1 are not exceeded.

B. Iodines and Particulates with Half Lives Greater than Eight Days

Compliance with the dose rate limitations for iodines and particulates is demonstrated by analysis of the charcoal and particulate samples of the station main vents. The charcoal samples are analyzed by gamma spectroscopy for quantification of radioiodine. The particulate samples are analyzed by gamma spectroscopy for quantification of particulate radioactive material. All of the above parameters are calculated according to the methodology specified in the ODCM.

C. Liquid Effluents

The Maximum Permissible Concentrations (MPCs) used for radioactive materials released in liquid effluents are in accordance with ODCM 3.11.1.1 and the values from 10 CFR Part 20, Appendix B, Table II, Column 2 including applicable table notes. In all cases, the more restrictive (lower) MPC found for each radionuclide is used regardless of solubility.

III. TECHNICAL SPECIFICATION REPORTING REQUIREMENTS

A. Calvert Cliffs Nuclear Power Plant (CCNPP), Technical Specification 5.6.3

1. 2009 Dose Assessment Summary

	Actual Value	Percent of ODCM limit	ODCM Limit
Liquid Waste:			
Maximum Annual Organ Dose (mRem) [1]	0.0028	0.01%	20
Maximum Whole Body Dose (mRem)	0.0017	0.03%	6
Gaseous Waste: Noble Gases:			
Maximum Quarterly Gamma Air Dose (mRad)	0.002	0.02%	10
Maximum Quarterly Beta Air Dose (mRad)	0.013	0.07%	20
Iodines and Particulates:			
Maximum Annual Organ Dose (mRem) [2]	0.0008	0.003%	30

1. The controlling pathway was the fish and shellfish pathway with adult as the controlling age group and the GI-LLI representing the organ with the highest calculated dose during the calendar year of 2009.

2 The controlling pathway was the child-thyroid pathway representing the organ with the highest calculated dose during the calendar year of 2009. There is currently no milk pathway.

2. 40 CFR 190 Total Dose Compliance

Based upon the calendar year 2009 and the ODCM calculations, the maximum exposed individual would receive 0.01% of the allowable dose. During the calendar year 2009, there were no on-site sources of direct radiation that would have contributed to a significant or measurable off-site dose. The direct radiation contribution is measured by both on-site and off-site thermoluminescent dosimeters (TLDs). The results of these measurements did not indicate any statistical increase in the off-site radiation doses attributable to on-site sources. Therefore, no increase in the calculated offsite dose is attributed to the direct exposure from on-site sources. A more detailed evaluation may be found in the Annual Radiological Environmental Operating Report.

3. Solid Waste Report Requirements

During 2009, the types of radioactive solid waste shipped from Calvert Cliffs were dry compressible waste, spent resins, irradiated components, and cartridge filters which were shipped in either High Integrity Containers (HICs) within NRC approved casks, Sea/Land containers, or steel boxes. Appendix A provides a detailed breakdown of the waste shipments for 2009 per Technical Specification 5.6.3. At CCNPP, methods of waste and materials segregation are used to reduce the volume of solid waste shipped offsite for processing, volume reduction, and burial.

4. Offsite Dose Calculation Manual (ODCM) and Process Control Program (PCP) Changes

The ODCM was not revised during calendar year 2009. The PCP was not revised in 2009.

B. Radioactive Effluent Monitoring Instrumentation

1. The Unit 1 Steam Generator Blowdown Radiation Monitor 1-RE-4014 was inoperable during the calendar year 2009. The Unit-1 Radiation Monitor 1-RE-4014 was out of service due to an unavailability of spare parts and is expected to be operable in 2010. There are two radiation monitors on the Unit-1 steam generator blowdown line: 1-RE-4014 and 1-RE-4095. The ODCM requires that one channel remain operable. No compensatory actions were required to be performed during this reporting period as the ODCM requirements were met by 1-RE-4095.

2. The Liquid Radwaste Monitor 0-RE-2201 was out of service for greater than 30 days due to the following:

- Delays in tagging out existing RMS equipment to support installation of new equipment.
- Problems with test equipment used during the Engineering Test Procedure.
- Introduction of contaminated fluid into the sample skid, causing high background and delaying the performance of the ETP.
- Modifications to the plant computer were not completed in time to support testing.
- Errors in revised Operating Procedure and Surveillance Test Procedures. The procedures could not be performed as written.

During the period the Radiation Monitor was inoperable, compensatory actions were performed in accordance with the ODCM requirements.

C. Independent Spent Fuel Storage Installation (ISFSI), ISFSI Technical Specification 6.1

Three (3) casks of spent fuel were transferred to the ISFSI during 2009. No quantity of radionuclides was released to the environment during the ISFSI operation in 2009. Additional information regarding the ISFSI radiological environmental monitoring program is included in the Annual Radiological Environmental Operation Report.

IV. AVERAGE ENERGY

Not Applicable.

V. MEASUREMENTS AND APPROXIMATIONS AND TOTAL RADIOACTIVITY

A. Fission and Activation Gases

1. Batch Releases

Prior to each batch release of gas from a pressurized waste gas decay tank or containment, a sample is collected and analyzed by gamma spectroscopy using a

germanium detector for the principal gamma emitting noble gas radionuclides. The total activity released is based on the pressure/volume relationship (gas laws). The Plant Vent Stack Radiation Monitor typically monitors containment releases, and the values from the radiation monitor may be used to assist in the calculation of activity discharged from containment during venting.

2. Continuous Releases

A gas sample is collected at least weekly from the main vents and analyzed by gamma spectroscopy using a germanium detector for the principal gamma emitting noble gas radionuclides. The total activity released for the week is based on the total sample activity decay corrected to the sample time multiplied by the main vent flow for the week. The Plant Vent Stack Radiation Monitor continuously measures routine plant vent stack releases, per design, and the values from the radiation monitor may be used to assist in the calculation of activity discharged in routine plant vent stack discharges.

Prior to and after each containment purge, a gas sample is collected and analyzed by gamma spectroscopy using a germanium detector to determine the concentration of principal gamma emitting noble gas radionuclides inside containment. The total activity released is based on containment volume and purge rate. Alternatively, total activity released during a containment purge is based on continuous radiation monitor responses, grab samples, and purge fan flow rate.

A monthly composite sample is collected from the main vents and analyzed by liquid scintillation for tritium. The total tritium release for the month is based on the sample analysis and the main vent flow.

B. Iodine and Particulates

1. Batch Releases

The total activities of radioiodines and particulates released from pressurized waste gas decay tanks, containment purges, and containment vents are accounted for by the continuous samplers on the main vent.

2. Continuous Releases

During the release of gas from the main vents, samples of iodines and particulates are collected using a charcoal and particulate filter, respectively. The filters are removed weekly (or more often) and are analyzed by gamma spectroscopy using a germanium detector for significant gamma emitting radionuclides. The total activity released for the week is based on the total sample activity decay corrected to the midpoint of the sample period multiplied by the main vent flow for the week. A plate-out correction factor is applied to the results to account for the amount of iodine lost in the sample lines prior to sample collection. The weekly particulate filters are then combined to form monthly and quarterly composites for the gross alpha and strontium-89 and strontium-90 analyses.

C. Liquid Effluents

1. Batch Releases

Prior to the release of liquid from a waste tank, a sample is collected and analyzed by gamma spectroscopy for the principal gamma emitting radionuclides. To demonstrate compliance with the concentration requirements addressed in Section I.C.1 above, the measured radionuclide concentrations are compared with the allowable MPCs; dilution in the discharge conduit is considered, and an allowable release rate is verified.

The total activity released in each batch is determined by multiplying the volume released by the concentration of each radionuclide. The actual volume released is based on the difference in tank levels prior to and after the release. A proportional composite sample is also withdrawn from each release, and this is used to prepare monthly tritium and gross alpha, iron-55, nickel-63, strontium-89, and strontium-90 samples for analysis are prepared quarterly for offsite analysis.

Batch discharges of secondary (normally uncontaminated) waste streams are also monitored for radioactivity. No activity is normally detected in these secondary waste streams.

There were no major changes to the liquid radwaste system in calendar year 2009.

2. Continuous Releases

To account for activity from continuous releases, a sample is collected and analyzed by gamma spectroscopy for the principal gamma emitting radionuclides. The measured radionuclide concentrations are compared with the allowable MPC concentrations in the discharge conduit, and an allowable release rate is verified.

When steam generator blowdown is discharged to the circulating water conduits, it is sampled and gamma isotopic analysis is performed at a minimum of three times per week and these samples are used in turn to prepare a weekly blowdown composite sample based on each day's blowdown. These results are multiplied by the actual quantity of blowdown to determine the total activity released. The weekly composite is also used to prepare monthly composites for tritium analysis.

During periods of primary-to-secondary leakage, the secondary system becomes contaminated and subsequently contaminates the turbine building sumps. The low-level activity water (predominantly tritium) contained in the turbine building sumps is discharged to the circulating water conduits. This water is sampled weekly and composited. The composite sample is analyzed at least monthly for tritium and principal gamma emitting radionuclides. The results are multiplied by the actual quantity of liquid released to determine the total activity released.

D. Estimation of Total Error

Total error for all releases was estimated using, as a minimum, the random counting error associated with typical releases. In addition to this random error, the following systematic errors were also examined:

1. Liquid
   a. Error in volume of liquid released prior to dilution during batch releases.
   b. Error in volume of liquid released via steam generator blowdown.
   c. Error in amount of dilution water used during the reporting period.

2. Gases
   a. Error in main vent release flow.
   b. Error in sample flow rate.
   c. Error in containment purge release flow.
   d. Error in gas decay tank pressure.

Where errors could be estimated they are usually considered additive.

E. Reporting and Recordkeeping for Decommissioning

In accordance with 10 CFR 50.75.g, each licensee shall keep records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the Commission. If records of relevant information are kept for other purposes, reference to these records and their locations may be used. Information the Commission considers important to decommissioning consists of records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when significant contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations.

To assist in the decommissioning, and to provide early and advance detection of any unmonitored releases of radioactive material from the site, groundwater is routinely sampled. These groundwater samples are analyzed for gamma and tritium activity. Sample size and/or count times are adjusted to achieve analytical sensitivities better than the environmental LLDs for gamma emitters (listed in ODCM Table 4.12-1), and approximately 350 pCi/l for tritium.

Groundwater samples were collected from five piezometer tubes in 2009. A piezometer tube is a shallow monitoring well which allows access to groundwater at a depth of approximately 40 feet beneath the site. Of the five piezometer tubes sampled in 2009 the #11 piezometer tube shows low concentrations of tritium, with no plant related fission and activation products detected. The source of the tritium has been identified and repaired. Monitoring of this well shows only changes due to natural attenuation with no additional contamination in the groundwater plume. The 2009 tritium and gross gamma analyses results are reproduced on the following tables.

Concentration of Tritium in Groundwater
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Sample Date	Piezometer Tube #s				
	11	12	13	15	18
01/07/2009	863 +/-181	--	--	--	--
01/31/2009	703 +/-181	<313	<313	<313	<313
03/10/2009	359 +/-181	--	--	--	--
06/17/2009	788 +/-180	<286	<286	<282	<282
09/03/2009	1310 +/-190	<291	<285	<285	<285
12/5/2009	786 +/-179	<283	<283	<283	<283

Gross Concentration of Gamma Emitters
(Results in units of pCi/L +/- 2σ)

Sample Date	Piezometer Tube #s				
	11	12	13	15	18
1/31/2009	*	*	*	*	*
6/17/2009	*	*	*	*	*
9/03/2009	*	*	*	*	*
12/5/2009	*	*	*	*	*

*All Non-Natural Gamma Emitters < MDA

VI. BATCH RELEASES

	2009			
	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
A. Liquid				
1. Number of batch releases	20	14	15	10
2. Total time period for batch releases (min)	2.66E+05	1.79E+05	1.50E+05	1.35E+05
3. Maximum time period for a batch release (min)	4.46E+04	4.46E+04	1.46E+04	4.46E+04
4. Average time period for batch releases (min)	1.33E+04	1.28E+04	1.01E+04	1.22E+04
5. Minimum time period for a batch release (min)	3.30E+01	3.00E+01	3.00E+01	3.03E+01
6. Average stream flow during periods of effluent into a flowing stream (liters/min of dilution water)	4.46E+06	4.60E+06	4.59E+06	4.26E+06
B. Gaseous				
1. Number of batch releases	9	2	1	1
2. Total time period for batch releases (min)	5.24E+03	5.35E+02	2.74E+02	1.67E+03
3. Maximum time period for a batch release (min)	2.11E+03	2.75E+02	2.74E+02	1.67E+03
4. Average time period for batch release (min)	5.82E+02	2.68E+02	2.74E+02	1.67E+03
5. Minimum time period for a batch release (min)	5.00E+00	2.60E+02	2.74E+02	1.67E+03

VII. ABNORMAL RELEASES

	2009			
	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
A. Liquid				
1. Number of releases	- 0 -	- 0 -	- 0 -	- 0 -
2. Total activity released (Curies)	- 0 -	- 0 -	- 0 -	- 0 -
B. Gaseous				
1. Number of releases	- 0 -	- 0 -	- 0 -	- 0 -
2. Total activity releases (Curies)	- 0 -	- 0 -	- 0 -	- 0 -

TABLE 1A - REG GUIDE 1.21
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. FISSION AND ACTIVATION GASES	UNITS	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	EST. TOTAL ERROR, %
1. Total Release	Ci	2.18E+02	6.33E+00	3.55E+01	9.84E+00	±1.20E+01
2. Average release rate for period	µCi/sec	2.80E+01	8.43E-01	4.46E+00	1.24E+00	
3. Percent of Tech. Spec. limit (1)	%	8.64E-04	8.64E-04	8.64E-04	2.64E-04	
4. Percent of Tech. Spec. limit (2)	%	5.10E-04	5.10E-04	5.10E-04	5.10E-04	
5. Percent of Tech. Spec. limit (3)	%	4.40E-02	8.75E-04	3.60E-03	3.13E-03	
6. Percent of Tech. Spec. limit (4)	%	2.58E-02	2.58E-02	2.58E-02	2.58E-02	
7. Percent of Tech. Spec. limit (5)	%	9.45E-02	3.46E-03	9.15E-03	3.95E-03	
8. Percent of Tech. Spec. limit (6)	%	5.55E-02	5.55E-02	5.55E-02	5.55E-02	
B. IODINES						
1. Total Iodine - 131	Ci	2.13E-03	6.25E-05	2.21E+00	7.88E-06	±6.50E+00
2. Average release rate for period	µCi/sec	2.74E-04	7.95E-06	2.77E-04	9.92E-07	
4. Percent of Tech. Spec. limit (7)	%	4.13E-01	5.77E-04	4.25E-01	5.76E-04	
5. Percent of Tech. Spec. limit (8)	%	4.27E-02	2.63E-03	4.27E-01	4.27E-01	
C. PARTICULATES						
1. Particulates with half lives greater than 8 days	Ci	9.75E-09	4.03E-07	(9)	(9)	±1.20E+01
2. Average release rate for period	µCi/sec	1.254E-09	5.12E-08	(9)	(9)	
4. Percent of Tech. Spec. limit (7)	%	4.13E-01	2.02E-05	(9)	(9)	
5. Percent of Tech. Spec. limit (8)	%	4.27E-02	1.01E-05	(9)	(9)	
6. Gross alpha radioactivity	Ci	(9)	(9)	(9)	(9)	±2.50E+01
D. TRITIUM						
1. Total Release	Ci	5.19E-01	1.15E+00	1.99E+00	1.01E+00	±1.32E+01
2. Average release rate for period	µCi/sec	6.67E-02	1.46E-01	2.51E-01	1.26E-01	

TABLE 1A - REG GUIDE 1.21
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

NOTES TO TABLE 1A

(1) Percent of I.A.1 whole body dose rate limit (500 mRem/year)

(2) Percent of I.A.1 skin dose rate limit (3000 mRem/year)

(3) Percent of I.A.3 quarterly gamma-air dose limit (10 mRad)

(4) Percent of I.A.3 yearly gamma-air dose limit (20 mRad)

(5) Percent of I.A.3 quarterly beta-air dose limit (20 mRad)

(6) Percent of I.A.3 yearly beta-air dose limit (40 mRad)

(7) Percent of I.B.3 quarterly organ dose limit (15 mRem)

(8) Percent of I.B.3 yearly organ dose limit (30 mRem)

(9) Less than minimum detectable activity which meets the lower limit of detection (LLD) requirements of ODCM Surveillance Requirement 4.11.2.1.2.

TABLE 1C - REG GUIDE 1.21
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

			CONTINUOUS MODE				BATCH MODE			
	UNITS	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
1. FISSION AND ACTIVATION GASES									
Argon -41	Ci	4.50E-04	(2)	5.71E-02	(2)	2.22E-03	1.88E-03	2.29E-03	2.10E-03
Krypton -85	Ci	3.10E+01	(2)	1.60E+01	(2)	1.19E+01	3.27E+00	6.14E+00	4.96E-02
Krypton -85m	Ci	5.84E-04	(2)	2.09E-01	(2)	(2)	(2)	(2)	(2)
Krypton -87	Ci	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Krypton -88	Ci	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Xenon -131m	Ci	8.38E+00	(2)	(2)	(2)	3.02E-01	(2)	(2)	(2)
Xenon -133	Ci	1.51E+02	2.36E+00	5.71E-02	(2)	1.20E+01	2.77E-03	2.29E-03	2.10E-03
Xenon -133m	Ci	1.43E+00	(2)	(2)	(2)	3.57E-02	(2)	(2)	(2)
Xenon -135	Ci	1.52E+00	(2)	3.44E-01	5.27E-01	1.52E-05	(2)	1.52E-05	(2)
Xenon -135m	Ci	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Xenon -138	Ci	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Total for Period	Ci	1.93E+02	3.36E+00	2.92E+01	9.79E+00	2.42E+01	3.27E+00	6.16E+00	5.23E-02
2. HALOGENS									
Iodine -131	Ci	2.13E-03	6.25E-05	2.21E-03	7.88E-06	2.14E-07	(2)	(2)	(2)
Iodine -132	Ci	2.34E-02	(2)	1.32E+00	(2)	(1)	(1)	(1)	(1)
Iodine -133	Ci	2.13E-03	4.36E-04	6.80E-04	(2)	3.51E-08	(1)	(1)	(1)
Iodine -135	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Total for Period	Ci	2.78E-02	4.98E-04	1.32E+00	7.88E-06	2.49E-07	(2)	(2)	(2)
3. PARTICULATES (half life > 8 days)									
Manganese -54	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Iron -55	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Iron -59	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Cobalt -58	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Cobalt -60	Ci	(2)	(2)	(2)	(2)	9.75E-09	(1)	(1)	(1)
Zinc -65	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Strontium -89	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Strontium -90	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Molybdenum -99	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Cesium -134	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Cesium -137	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Cerium -141	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)

TABLE 1C - REG GUIDE 1.21
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

	UNITS	CONTINUOUS MODE				BATCH MODE			
		1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Cerium -144	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Gross Alpha	Ci	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(1)
Total For Period	Ci	(2)	(2)	(2)	(2)	9.75E-09	(1)	(1)	(1)

NOTES TO TABLE 1C

(1) Iodines and particulates in batch releases are accounted for with the main vent continuous samplers when the release is made through the plant main vent.

(2) Less than minimum detectable activity which meets the LLD requirements of ODCM Surveillance Requirement 4.11.2.1.2.

TABLE 2A - REG GUIDE 1.21
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

		UNITS	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	EST. TOTAL ERROR, %
A.	**FISSION AND ACTIVATION PRODUCTS**						
1.	Total Release (not including tritium, gases, alpha)	Ci	1.15E-02	4.66E-03	5.13E-03	4.85E-03	±1.03E+01
2.	Average diluted concentration during period	µCi/ml	7.37E-08	3.93E-08	5.27E-08	5.99E-08	
3.	Percent of Tech. Spec. limit (1)	%	4.17E-03	8.29E-03	8.76E-03	6.15E-03	
4.	Percent of Tech. Spec. limit (2)	%	1.41E-02	1.41E-02	1.41E-02	1.41E-02	
5.	Percent of Tech. Spec. limit (3)	%	2.08E-02	2.08E-02	2.08E-02	8.17E-03	
6.	Percent of Tech. Spec. limit (4)	%	2.87E-02	2.87E-02	2.87E-02	2.87E-02	
B.	**TRITIUM**						
1.	Total Release	Ci	4.36E+02	1.46E+02	5.21E+02	1.63E+02	±1.03E+01
2.	Average diluted concentration during period	µCi/ml	2.79E-03	1.23E-03	5.35E-03	2.02E-03	
3.	Percent of applicable limit (5)	%	9.30E+01	4.10E+01	1.78E+02	6.72E+01	
C.	**DISSOLVED AND ENTRAINED GASES**						
1.	Total Release	Ci	1.23E-01	1.14E-03	8.31E-02	7.40E-03	±1.03E+01
2.	Average diluted concentration during period	µCi/ml	7.84E-07	9.61E-09	8.53E-07	9.13E-08	
D.	**GROSS ALPHA RADIOACTIVITY**						
1.	Total Release	Ci	(6)	(6)	(6)	(6)	N/A
E.	**VOLUME OF WASTE RELEASED** (prior to dilution)						
1.	Volume processed through radwaste system	liters	2.50E+06	1.97E+06	1.58E+06	1.68E+06	±1.30E+00
F.	**VOLUME OF DILUTION WATER USED DURING PERIOD (7)**	liters	9.54E+11	1.18E+12	1.20E+12	1.20E+12	±1.64E+01

NOTES TO TABLE 2A

(1) Percent of I.C.3 Quarterly Organ Dose Limit (10 mRem) to maximum exposed organ
(2) Percent of I.C.3 Yearly Organ Dose Limit (20 mRem) to maximum exposed organ
(3) Percent of I.C.3 Quarterly Whole Body Dose Limit (3 mRem)
(4) Percent of I.C.3 Yearly Whole Body Dose Limit (6 mRem)
(5) Limit used is 3×10^{-3} µCi/ml
(6) Less than minimum detectable activity which meets the LLD requirements of ODCM Surveillance Requirement 4.11.1.1.1.
(7) Includes dilution water used during continuous discharges.

TABLE 2B - REG GUIDE 1.21
LIQUID EFFLUENTS

NUCLIDES RELEASED	Units	CONTINUOUS MODE				BATCH MODE			
		1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Beryllium – 7	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Sodium – 24	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Chromium - 51	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Manganese - 54	Ci	(1)	(1)	(1)	(1)	3.20E-05	8.67E-06	2.36E-05	1.16E-05
Iron – 55	Ci	(2)	(2)	(2)	(2)	5.55E-03	1.48E-03	2.58E-03	1.71E-03
Cobalt – 57	Ci	(1)	(1)	(1)	(1)	(1)	1.01E-05	(1)	3.97E-06
Cobalt – 58	Ci	(1)	(1)	(1)	(1)	2.25E-03	1.77E-03	1.65E-03	2.69E-03
Iron – 59	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Cobalt – 60	Ci	(1)	(1)	(1)	(1)	4.58E-04	2.05E-04	2.95E-04	3.55E-04
Nickel-63	Ci	(1)	(1)	(1)	(1)	4.09E-11	7.38E-04	4.72E-04	(1)
Zinc – 65	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Strontium - 89	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Strontium - 90	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Strontium - 92	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Niobium - 95	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	2.77E-05
Zirconium - 95	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Niobium - 97	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Zirconium - 97	Ci	(1)	(1)	(1)	(1)	1.82E-06	(1)	(1)	(1)
Molybdenum - 99	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Technetium - 99m	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Ruthenium - 103	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Rhodium - 105	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Ruthenium - 105	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Silver - 110m	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Tin – 113	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Tin – 117m	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Antimony - 122	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Antimony - 124	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Antimony - 125	Ci	(1)	(1)	(1)	(1)	(1)	1.68E-05	(1)	(1)
Tellurium – 125m	Ci	(1)	(1)	(1)	(1)	3.01E-06	(1)	(1)	(1)
Tellurium - 132	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Iodine - 131	Ci	(1)	(1)	(1)	(1)	1.18E-04	(1)	4.28E-06	(1)

TABLE 2B - REG GUIDE 1.21
LIQUID EFFLUENTS

NUCLIDES RELEASED	Units	CONTINUOUS MODE				BATCH MODE			
		1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER
Iodine - 132	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Iodine – 133	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Iodine – 135	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Cesium – 134	Ci	(1)	(1)	(1)	(1)	4.85E-05	1.39E-04	5.11E-05	1.83E-05
Cesium – 136	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Cesium – 137	Ci	(1)	(1)	(1)	(1)	4.01E-05	2.89E-04	5.69E-05	3.38E-05
Barium – 140	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Lanthanum - 140	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Cerium – 144	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Europium – 154	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Europium – 155	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Tungsten – 187	Ci	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Total For Period	Ci	(1)	(1)	(1)	(1)	1.15E-02	4.66E-03	5.13E-03	4.85E-03
Krypton – 85	Ci	(1)	(1)	(1)	(1)	6.69E-03	(1)	4.05E-02	5.54E-03
Xenon - 131m	Ci	(1)	(1)	(1)	(1)	1.18E-03	(1)	2.17E-03	(1)
Xenon – 133	Ci	(1)	(1)	(1)	(1)	1.14E-01	1.14E-03	4.04E-02	1.86E-03
Xenon – 133m	Ci	(1)	(1)	(1)	(1)	3.67E-04	(1)	(1)	(1)
Xenon – 135	Ci	(1)	(1)	(1)	(1)	2.20E-05	(1)	(1)	(1)
Total For Period	Ci	(1)	(1)	(1)	(1)	1.23E-01	1.14E-03	8.31E-02	7.40E-03

NOTES TO TABLE 2B

(1) Less than minimum detectable activity which meets the LLD requirements of ODCM Surveillance Requirement 4.11.1.1.1.

(2) Continuous mode effluents are not analyzed for Fe-55.

TABLE 3A
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

1. Type of Waste		Units	12-Month Period	Est. Total Error %
a)	Spent resins, Filters	m^3 Ci	7.20E+01 6.39E+02	25%
b)	Dry compressible waste, contaminated equipment, etc.	m^3 Ci	3.43E+02 5.46E-01	25%
c)	Irradiated components, control rods, etc.	m^3 Ci	0.00E-00 0.00E+00	N/A
d)	Other (cartridge filters, misc. dry compressible, Oil)	m^3 Ci	0.00E+00 0.00E+00	N/A

Volume shipped represents waste generated prior to offsite volume reduction.

2. Estimate of Major Nuclides (By Type of Waste - Only nuclides >1 % are reported)

a)

Fe-55	13.4%
Co-58	5.6%
Co-60	3.5%
Ni-63	12.0%
Cs-134	24.1%
Cs-137	39.7%

b)

H-3	1.4%
C-14	1.5%
Mn-54	1.1%
Fe-55	33.9%
Co-58	24.3%
Co-60	6.3%
Ni-63	21.0%
Nb-95	1.6%
Cs-134	1.8%
Cs-137	2.3%

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
14	Motor Surface Transit	Studsvik Processing Facility Memphis, TN
5	Motor Surface Transit	Studsvik Processing Facility Erwin, TN
2	Motor Surface Transit	Duratek (CVRF) Oak Ridge, TN

B. IRRADIATED FUEL SHIPMENTS (DISPOSITION) N/A