CALVERT CLIFFS NUCLEAR POWER PLANT
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
SUPPLEMENTAL INFORMATION

Facility - Calvert Cliffs Nuclear Power Plant

Licensee - Baltimore Gas & Electric Company

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 (Technical Specification 3/4.11.2.1).

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 2.40 mrad at the site boundary in a 92 day period (Technical Specification 3/4.11.2.4).

3. The air dose at the site boundary due to noble gases released in gaseous effluents shall not exceed (Technical Specification 3/4.11.2.2):

   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 Offsite Dose Calculation Manual (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 in excess of 1500 mrem/year to any organ (Technical Specification 3/4.11.2.1).

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 (Technical Specification 3/4.11.2.4).

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 (Technical Specification 3/4.11.2.3):

   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, for unrestricted areas (Technical Specification 3/4.11.1.1).

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 (Technical Specification 3/4.11.1.3).

3. The dose to a member of the public in unrestricted areas shall not exceed (Technical Specification 3/4.11.1.2):

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 Technical Specification 3/4.11.2.1 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 any release of radioiodines. 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 Offsite Dose Calculation Manual (ODCM).

C. Liquid Effluents

The MPCs used for radioactive materials released in liquid effluents are in accordance with Technical Specification 3/4.11.1.1 and the values from 10 CFR Part 20, Appendix B, 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 6.9.1.8

1. First Half 1995 Dose Assessment Summary

During the first half of 1995, liquid releases from Calvert Cliffs resulted in a calculated maximum annual organ dose of 0.03 mrem and a maximum whole body dose of 0.001 mrem. These doses are less than 0.16 % of the Technical Specification yearly organ dose limit and less than 0.04 % of the Technical Specification yearly dose limit for the whole body. The controlling pathway was the fish and shellfish pathway with adult as the controlling age group, and the gastrointestinal tract representing the organ with the highest calculated dose during the first half of 1995.

Gaseous Releases of noble gases resulted in a maximum, quarterly, gamma air dose of 0.0005 mrad and a maximum, quarterly, beta air dose of 0.001 mrad. Iodines and particulates in gaseous effluents from Calvert Cliffs resulted in a maximum organ dose of 0.014 mrem for the first half of the year via the child-infant-thyroid pathway. These doses were calculated using ODCM methodology. For the first half of 1995, calculated off-site doses via the gaseous release pathways were below 1 % of their allowable Technical Specification limits.

2. 40 CFR 190 Total Dose Compliance

Based upon the first half releases of 1995 and the ODCM calculations, the maximum exposed individual would receive less than 1% of the allowable dose. During the first half of calendar year 1995, 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 will be reported in the Annual Radiological Environmental Operating Report.

3. Solid Waste Report Requirements

During the first half of 1995, the type of radioactive solid waste shipped from Calvert Cliffs was dry compressible waste, which was shipped as LSA waste in Sealand containers and steel boxes. Appendix A provides a detailed breakdown of the waste shipments for the first half of 1995 per the categories specified in Technical Specification 6.9.1.8. At CCNPP, methods of waste and materials segregation are used to reduce the volume of solid waste shipped offsite for

processing and volume reduction. No waste was buried during the time period of this report.

4. ODCM and Process Control Program (PCP) Changes

No changes were made to the ODCM or PCP during the first half of 1995. However, PCP administrative controls were transferred to Nuclear Program Interdepartmental Procedures as a result of Calvert Cliffs Procedure Upgrade Project. A copy of the Interdepartmental Procedure RP-2-101 is included as Appendix B.

5. Radioactive Gaseous Effluent Monitoring Instrumentation

None of the Technical Specification effluent monitors were out of service for greater than 30 days.

B. Independent Spent Fuel Storage Installation (ISFSI), Technical Specification 6.3

One cask of spent fuel was transferred to the ISFSI during the first half of 1995. The cask was sealed within the confines of the Calvert Cliffs Auxiliary Building prior to transfer to the ISFSI facility. No quantity of radionuclides were released to the environment during the ISFSI operation in the first half of 1995. Additional information regarding the ISFSI radiation monitoring program will be 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 (Ge) detector for the principal gamma emitting noble gas radionuclides. The total activity released is based on the pressure/volume relationship (gas laws) of the tank.

2. Continuous Releases

A gas sample is collected at least weekly from the main vents and analyzed by gamma spectroscopy using a Ge 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.

Prior to and after each containment purge, a gas sample is collected and analyzed by gamma spectroscopy using a Ge detector for the principal gamma emitting noble gas radionuclides. The total activity released is based on containment volume and purge rate. Activity buildup while purging is also considered.

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 this sample analysis and the 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 and are analyzed by gamma spectroscopy using a Ge 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. These weekly particulate filters are then composited to form monthly and quarterly composites for the gross alpha and strontium 89 and 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 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 for each release and this is used in turn to prepare monthly and quarterly composites for the gross alpha, iron 55, strontium 89 and 90, and tritium analyses.

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 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. The weekly composite sample is analyzed by gamma spectroscopy for the principal gamma emitting radionuclides. 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 and gross alpha analyses.

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 released directly to the Chesapeake Bay. This water is sampled at least three times per week 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.

VI. BATCH RELEASES

			1995 1ST QUARTER	1995 2ND QUARTER
A.	Liquid			
	1.	Number of batch releases	4.50E+01	4.20E+01
	2.	Total time period for batch releases (min)	1.32E+04	1.22E+04
	3	Maximum time period for a batch release (min)	2.03E+03	1.97E+03
	4.	Average time period for batch releases (min)	2.88E+02	2.91E+02
	5.	Minimum time period for a batch release (min)	2.70E+01	2.80E+01
	6.	Average stream flow during periods of effluent into a flowing stream (liters/min of dilution water)	8.72E+06	7.11E+06
B.	Gaseous			
	1.	Number of batch releases	1.30E+01	1.40E+01
	2.	Total time period for batch releases (min)	1.16E+04	1.30E+04
	3.	Maximum time period for a batch release (min)	2.55E+03	4.32E+03
	4.	Average time period for batch release (min)	8.94E+02	9.32E+02
	5.	Minimum time period for a batch release (min)	4.50E+01	1.00E+00

VII. ABNORMAL RELEASES

			1995 1ST QUARTER	1995 2ND QUARTER
A.	Liquid			
	1.	Number of releases	- 0 -	- 0 -
	2.	Total activity released (Curies)	- 0 -	- 0 -
B.	Gaseous			
	1.	Number of releases	- 0 -	- 0 -
	2.	Total activity releases (Curies)	- 0 -	- 0 -

TABLE 1A - REG GUIDE 1.21

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GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. FISSION AND ACTIVATION GASES	UNITS	1ST QUARTER	2ND QUARTER	EST. TOTAL ERROR, %
1. Total Release	Ci	4.56E+01	1.55E+01	±1.20E+01
2. Average release rate for period	uCi/sec	5.86E+00	1.97E+00	
3. Percent of Tech. Spec. limit(1)	%	8.49E-04	2.38E-04	
4. Percent of Tech. Spec. limit(2)	%	1.43E-03	4.50E-04	
5. Percent of Tech. Spec. limit(3)	%	6.14E-03	3.47E-03	
6. Percent of Tech. Spec. limit(4)	%	3.07E-03	1.74E-03	
7. Percent of Tech. Spec. limit(5)	%	1.83E-02	6.68E-03	
8. Percent of Tech. Spec. limit(6)	%	9.15E-03	3.34E-03	
B. IODINES				
1. Total Iodine - 131	Ci	1.11E-03	4.54E-04	±6.50E+00
2. Average release rate for period	uCi/sec	1.43E-04	5.78E-05	
3. Percent of Tech. Spec. limit(7)	%	3.39E-04	1.39E-04	
4. Percent of Tech. Spec. limit(8)	%	2.13E-01	1.06E-01	
5. Percent of Tech. Spec. limit(9)	%	8.70E-02	4.35E-02	
C. PARTICULATES				
1. Particulates with half lives greater than 8 days	Ci	1.69E-05	1.54E-05	±2.80E+01
2. Average release rate for period	uCi/sec	2.17E-06	1.96E-06	
3. Percent of Tech. Spec. limit(7)	%	2.85E-07	2.59E-07	
4. Percent of Tech. Spec. limit(8)	%	1.85E-04	1.73E-04	
5. Percent of Tech. Spec. limit(9)	%	9.24E-05	8.67E-05	
6. Gross alpha radioactivity	Ci	(10)	(10)	N/A

TABLE 1A - REG GUIDE 1.21 (Continued)

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GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

D. TRITIUM	UNITS	1ST QUARTER	2ND QUARTER	EST. TOTAL ERROR, %
1. Total Release	Ci	4.02E-01	9.36E-01	±1.32E+01
2. Average release rate for period	uCi/sec	5.17E-02	1.19E-01	

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 gamma quarterly dose limit (10 mrad)

(4) Percent of I.A.3 gamma yearly dose limit (20 mrad)

(5) Percent of I.A.3 beta quarterly dose limit (20 mrad)

(6) Percent of I.A.3 beta yearly dose limit (40 mrad)

(7) Percent of I.B.1 organ dose rate limit (1500 mrem/year)

(8) Percent of I.B.3 quarterly organ dose limit (15 mrem)

(9) Percent of I.B.3 yearly organ dose limit (30 mrem)

(10) Less than minimum detectable activity which meets the LLD requirements of Technical Specification Surveillance Requirement 4.11.2.1.2.

TABLE 1C - REG GUIDE 1.21

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GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

			CONTINUOUS MODE		BATCH MODE	
1. FISSION AND ACTIVATION GASES	UNITS		1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Argon	-41	Ci	(2)	(2)	1.15E-02	4.08E-03
Krypton	-85	Ci	(2)	(2)	2.63E+00	2.76E+00
Krypton	-85m	Ci	(2)	(2)	(2)	(2)
Krypton	-87	Ci	(2)	(2)	(2)	(2)
Krypton	-88	Ci	(2)	(2)	(2)	(2)
Xenon	-131m	Ci	4.86E-01	7.58E-02	(2)	4.25E-03
Xenon	-133	Ci	4.08E+01	1.23E+01	1.45E-01	1.23E-01
Xenon	-133m	Ci	(2)	(2)	1.39E-03	1.02E-03
Xenon	-135	Ci	1.53E+00	2.52E-01	1.17E-03	9.31E-04
Xenon	-138	Ci	(2)	(2)	(2)	(2)
Total for Period		Ci	4.28E+01	1.26E+01	2.79E+00	2.89E+00
2. HALOGENS						
Iodine	-131	Ci	1.11E-03	4.54E-04	(1)	3.08E-07
Iodine	-133	Ci	1.21E-03	2.06E-03	8.49E-06	2.78E-07
Total For Period Ci		Ci	2.32E-03	2.51E-03	8.49E-06	5.86E-07

TABLE 1C - REG GUIDE 1.21 (Continued)

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GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
		1ST	2ND	1ST	2ND
3. PARTICULATES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
Manganese -54	Ci	(2)	(2)	(1)	(1)
Iron -59	Ci	(2)	(2)	(1)	(1)
Cobalt -58	Ci	(2)	(2)	(1)	(1)
Cobalt -60	Ci	(2)	(2)	4.20E-08	(1)
Zinc -65	Ci	(2)	(2)	(1)	(1)
Strontium -89	Ci	(2)	(2)	(1)	(1)
Strontium -90	Ci	(2)	(2)	(1)	(1)
Molybdenum -99	Ci	(2)	(2)	(1)	(1)
Cesium -134	Ci	(2)	(2)	(1)	2.78E-06
Cesium -137	Ci	8.55E-06	1.55E-06	8.29E-06	1.11E-05
Cerium -141	Ci	(2)	(2)	(1)	(1)
Cerium -144	Ci	(2)	(2)	(1)	(1)
Gross Alpha Radioactivity	Ci	(2)	(2)	(1)	(1)
Total For Period Ci	Ci	8.55E-06	1.55E-06	8.33E-06	1.39E-05

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 Technical Specification Surveillance Requirement 4.11.2.1.2.

TABLE 2A - REG GUIDE 1.21

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LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	UNITS	1ST QUARTER	2ND QUARTER	EST. TOTAL ERROR, %
A. FISSION AND ACTIVATION PRODUCTS				
1. Total Release (not including tritium, gases, alpha)	Ci	2.98E-01	1.77E-01	±1.03E+01
2. Average diluted concentration during period	uCi/ml	2.64E-10	1.89E-10	
3. Percent of Tech. Spec. limit(1)	%	3.57E-01	6.90E-01	
4. Percent of Tech. Spec. limit(2)	%	1.78E-01	3.45E-01	
5. Percent of Tech. Spec. limit(3)	%	2.27E-01	7.70E-02	
6. Percent of Tech. Spec. limit(4)	%	1.14E-01	3.85E-02	
B. TRITIUM				
1. Total Release	Ci	1.40E+02	1.26E+02	±1.04E+01
2. Average diluted concentration during period	uCi/ml	1.24E-07	1.35E-07	
3. Percent of applicable limit(5)	%	4.13E-03	4.51E-03	
C. DISSOLVED AND ENTRAINED GASES				
1. Total Release	Ci	8.79E-02	7.82E-03	±1.20E+01
2. Average diluted concentration during period	uCi/ml	7.78E-11	8.38E-12	

TABLE 2A - REG GUIDE 1.21 (Continued)

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LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	UNITS	1ST QUARTER	2ND QUARTER	ERROR, %
D. GROSS ALPHA RADIOACTIVITY				
1. Total Release	Ci	(6)	(6)	
E. VOLUME OF WASTE RELEASED (prior to dilution)	liters	1.97E+07	9.70E+06	±1.30E+00
F. VOLUME OF DILUTION WATER USED DURING PERIOD	liters	1.13E+12	9.33E+11	±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} uCi/ml

(6) Less than minimum detectable activity which meets the LLD requirements of Technical Specification Surveillance Requirement 4.11.1.1.1.

TABLE 2B - REG GUIDE 1.21

CALVERT CLIFFS NUCLEAR POWER PLANT
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LIQUID EFFLUENTS

			CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED		UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Sodium	-24	Ci	(1)	(1)	(1)	(1)
Chromium	-51	Ci	(1)	(1)	(1)	1.86E-02
Manganese	-54	Ci	(1)	(1)	1.23E-03	4.34E-04
Iron	-55	Ci	(2)	(2)	1.98E-01	8.56E-02
Cobalt	-57	Ci	(1)	(1)	1.73E-04	3.85E-05
Cobalt	-58	Ci	(1)	(1)	3.14E-02	2.18E-02
Iron	-59	Ci	(1)	(1)	6.45E-04	1.40E-03
Cobalt	-60	Ci	(1)	(1)	1.14E-02	3.04E-03
Zinc	-65	Ci	(1)	(1)	(1)	(1)
Strontium	-89	Ci	(1)	(1)	4.97E-03	4.25E-04
Strontium	-90	Ci	(1)	(1)	1.09E-04	5.69E-05
Strontium	-92	Ci	(1)	(1)	8.79E-05	1.69E-04
Niobium	-95	Ci	(1)	(1)	2.68E-03	4.43E-03
Zirconium	-95	Ci	(1)	(1)	1.25E-03	3.50E-03
Niobium	-97	Ci	(1)	(1)	6.21E-06	(1)
Zirconium	-97	Ci	(1)	(1)	(1)	(1)
Molybdenum	-99	Ci	(1)	(1)	(1)	(1)
Technetium	-99m	Ci	(1)	(1)	(1)	3.36E-05
Ruthenium	-103	Ci	(1)	(1)	2.61E-05	7.94E-04
Ruthenium	-106	Ci	(1)	(1)	4.67E-03	(1)
Silver	-110m	Ci	(1)	(1)	1.44E-03	4.39E-03
Tin	-113	Ci	(1)	(1)	6.61E-04	1.83E-03

TABLE 2B - REG GUIDE 1.21 (Continued)

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LIQUID EFFLUENTS

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Antimony -122	Ci	(1)	(1)	4.33E-05	(1)
Antimony -124	Ci	(1)	(1)	4.04E-05	3.24E-03
Antimony -125	Ci	(1)	(1)	1.62E-02	2.37E-02
Tellurium -127	Ci	(1)	(1)	(1)	(1)
Tellurium -129	Ci	(1)	(1)	(1)	(1)
Iodine -131	Ci	(1)	(1)	9.19E-04	3.09E-04
Iodine -133	Ci	(1)	(1)	3.78E-05	9.53E-05
Iodine -135	Ci	(1)	(1)	(1)	(1)
Cesium -134	Ci	(1)	(1)	6.14E-03	8.56E-04
Cesium -136	Ci	(1)	(1)	(1)	(1)
Cesium -137	Ci	(1)	(1)	1.45E-02	1.72E-03
Barium -139	Ci	(1)	(1)	(1)	(1)
Barium -140	Ci	(1)	(1)	2.78E-06	(1)
Cerium -139	Ci	(1)	(1)	(1)	(1)
Lanthanum -140	Ci	(1)	(1)	1.92E-04	9.09E-06
Cerium -141	Ci	(1)	(1)	(1)	5.82E-05
Cerium -144	Ci	(1)	(1)	1.31E-03	(1)
Tungsten -187	Ci	(1)	(1)	(1)	(1)
Total For Period	Ci	(1)	(1)	2.98E-01	1.77E-01

TABLE 2B - REG GUIDE 1.21 (Continued)

CALVERT CLIFFS NUCLEAR POWER PLANT
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
FIRST HALF - 1995
LIQUID EFFLUENTS

			CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED		UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Krypton	-85	Ci	(1)	(1)	(1)	(1)
Xenon	-131m	Ci	(1)	(1)	(1)	(1)
Xenon	-133	Ci	(1)	(1)	8.79E-02	7.82E-03
Xenon	-133m	Ci	(1)	(1)	(1)	(1)
Xenon	-135	Ci	(1)	(1)	8.46E-06	(1)
Xenon	-135m	Ci	(1)	(1)	(1)	(1)
Total For Period		Ci	(1)	(1)	8.79E-02	7.82E-03

NOTES TO TABLE 2B

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

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

TABLE 3A

CALVERT CLIFFS NUCLEAR POWER PLANT
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
FIRST HALF - 1995

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

1. Type of Waste	UNITS	6-MONTH PERIOD	EST. TOTAL ERROR %
a. Dewatered spent resin	m^3	0.00E+00	
	Ci	0.00E+00	N/A
b. Dry Compressible Waste (Shipped)	m^3	3.89E+02	
Contaminated Equipment, etc.	Ci	1.07E+00	±5.00E+01
c. Irradiated Components,	m^3	0.00E+00	
Control Rods, etc.	Ci	0.00E+00	N/A
d. Other (Cartridge Filters)	m^3	0.00E+00	
	Ci	0.00E+00	N/A

(b.) Volume represents waste generated prior to offsite volume reduction. No waste was buried during the time period of this report.

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

a. N/A

b. H-3	1.85E+00%
C-14	1.58E+00%
Cr-51	8.01E+00%
Fe-55	2.30E+01%
Co-58	1.37E+01%
Co-60	2.33E+00%
Ni-63	1.61E+00%
Nb-95	1.60E+00%
Zr-95	1.30E+00%
Cs-134	1.34E+01%
Cs-137	3.03E+01%
Ce-144	1.16E+00%

c. N/A

d. N/A

3. **Solid Waste Disposition**

Number of Shipments	Mode of Transportation	Destination
10	Motor Surface Transit	Scientific Ecology Group Oak Ridge, TN

APPENDIX A

CALVERT CLIFFS NUCLEAR POWER PLANT
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
FIRST HALF - 1995

TYPE WASTE: DAW

10 CFR PART 61 WASTE CLASS: A

SOURCE OF WASTE: Radiologically Controlled Areas

SHIPPING CONTAINER: 20' & 40' Sealand Containers and 90 cubic foot Steel Boxes

TOTAL CURIE QUANTITY: 1.07 Ci

HOW DETERMINED: Dose to curie content, conversion by volume based on generic distribution and scaling factors

TOTAL SHIPPED WASTE VOLUME: 13,734 ft^3

TOTAL BURIAL WASTE VOLUME: N/A

HOW DETERMINED: Container volume and number of containers shipped

SOLIDIFICATION AGENT OR ABSORBENT: None

APPENDIX B

INTERDEPARTMENTAL PROCEDURE RP-2-101

Calvert Cliffs Nuclear Power Plant
Administrative Procedure

RADIOACTIVE WASTE MANAGEMENT

RP-2-101

Revision 0

Effective Date JAN 18 1995

USER CONTROLLED
JAN 18 95

Tech Spec Related X

Management Related ____

Writer: C. L. Point

Sponsor: B. A. Watson, General Supervisor - Radiation Safety

Approved _____ 8/19/94
Superintendent - Technical Support Date

RECORD OF REVISIONS AND CHANGES

REVISION	CHANGE	SUMMARY OF REVISION OR CHANGE
0		Initial Issue. Replaces part of CCI-800, Calvert Cliffs Radiation Safety Manual, and CCI-803, Radioactive Materials Management.

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1.0 INTRODUCTION

1.1 Purpose

This procedure establishes the processes necessary for the control, treatment, and management of Dry Active Waste (DAW) and Wet Solid Radioactive Waste generated at the Calvert Cliffs Nuclear Power Plant (CCNPP). **[B-1]**

1.2 Scope/Applicability

A. This procedure provides the steps to be taken to:

1. Minimize the volume of DAW produced on site.

2. Control handling, processing, storage, accountability, and eventual off-site disposal of DAW and wet solid radioactive waste originating from CCNPP.

B. This procedure applies to BGE personnel and contractors involved in the:

1. Generation of radioactive waste.

2. Processing of DAW and wet solid radioactive waste.

3. Handling, storage, and shipment of DAW and wet solid radioactive waste.

C. This procedure does not apply to:

1. The Independent Spent Fuel Storage Installation (ISFSI) or spent fuel processing. Refer to EN-6, Independent Spent Fuel Storage Installation.

2. Radioactive Liquid and Gaseous Waste Processing Systems. Refer to CH-1, Chemistry Program. For Mixed Waste, refer to CH-1-101, Hazardous Waste Management.

2.0 REFERENCES

2.1 Developmental

A. 10 CFR 20, Standards for Protection Against Radiation

B. 10 CFR 61, Licensing Requirements for Land Disposal of Radioactive Waste

C. 10 CFR 71, Packaging and Transportation of Radioactive Material

D. 49 CFR, Parts 171-178, Transportation

E. Calvert Cliffs Updated Final Safety Analysis Report (UFSAR), Chapter 11, Waste Processing and Radiation Protection, and Chapter 12, Conduct of Operations

F. Calvert Cliffs Technical Specifications, Unit 1 and 2, Section 6.0

2.0 REFERENCES (Continued)

G. Calvert Cliffs Independent Spent Fuel Storage Installation (ISFSI) Updated Safety Analysis Report (USAR)

H. USNRC IE Bulletin 79-19, August 10, 1979, Packaging of Low-Level Radioactive Waste Transport and Burial

I. USNRC IE Circular Number 81-07, May 14, 1981, Control of Radioactively Contaminated Material

J. USNRC IE Notice 85-92, December 2, 1985, Surveys of Waste Before Disposal from Nuclear Reactor Facilities

K. NRC Information Notice No. 94-23, Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program

2.2 Performance

A. CH-1, Chemistry Program

B. CH-1-101, Hazardous Waste Management

C. MN-3-100, Painting and Other Protective Coatings

D. NS-2-101, Conduct of the Plant Operations and Safety Review Committee (POSRC)/Procedure Review Committee (PRC)/Qualified Reviewer (QR)

E. PR-1-101, Preparation and Control of Calvert Cliffs Technical Procedures

F. PR-3-100, Records Management

G. RP-1-100, Radiation Protection

H. Calvert Cliffs Radiation Safety Manual

3.0 DEFINITIONS

A. **Container**

A reusable device used to package radioactive material for transportation or storage (e.g., B-25 box, 55 gallon drum).

B. **Contaminated Area**

Any plant area where radioactive contamination exists or is likely to exist in such quantities as to require posting or barricading or a combination of both for personnel access control.

C. **Dry Active Waste (DAW)**

Dry, low-level radioactive material that has been determined to have no further value or use.

3.0 DEFINITIONS (Continued)

D. **Hazardous Waste**

Any solid, liquid, or gaseous waste that is not mixed waste, is listed as hazardous by a federal or state regulatory agency, or meets the criteria of 40 CFR 261, Subpart D or COMAR 26.13.02.15 through 19.

E. **Mixed Waste**

Any hazardous waste which also contains radioactive material.

F. **Protected Area**

Area bounded by the double security fence, to which free access of personnel and vehicles is restricted to provide for protection against radiological sabotage that could threaten the health and safety of the public or damage plant equipment.

G. **Radioactive Material**

Any substance (e.g., systems, structures, components, sources, waste, pens, pencils, clipboards, tools) exhibiting radioactivity.

H. **Radiologically Controlled Area (RCA)**

Any plant area where radiation, radioactive contamination, or radioactive material exists or is likely to exist in such quantities as to require posting for control of personnel access.

I. **Responsible Individual**

The person who elects to or is assigned to perform any of the steps in this procedure that have been designated for performance by the "Responsible Individual." The Responsible Individual can be anyone regardless of their job title.

J. **Special Work Permit (SWP)**

Written permit which provides radiological information for working safely in a Radiologically Controlled Area (RCA) and for handling radioactive material. This includes the following:

1. Work scope and duration.
2. Work location.
3. Authorized personnel.
4. Radiological conditions.
5. Dose estimate for the job.
6. Radiation Safety Technician coverage.

3.0 DEFINITIONS (Continued)

7. Required Protective Equipment.

8. Required Dosimetry.

9. Pre-job Briefing (when applicable).

K. **Wet Solid Radioactive Waste**

Solids removed from radioactive liquid process systems (e.g., spent resins, filter sludges, bead resins, filter cartridges) that do not meet the criteria for DAW and have been determined to have no further value or use.

4.0 RESPONSIBILITIES

NOTE

The following titled individuals or groups have responsibilities in this procedure. To assist the user, the sections or subsections where the titled individuals or groups have responsibilities are listed.

A. Responsible Individual - 5.2.B.1, 5.2.B.3, 5.2.B.5, 5.2.B.8

B. Supervisor - Radiation Plant Support (S - RPS) - 5.2.A.1, 5.2.B.4

C. Supervisor - Materials Processing (S - MP) - 5.2.A.2

D Radiation Control - Operations (RC - O) - 5.2.B.6

E. Radiation Safety Technician (RST) - 5.2.B.7

F. Contractor Radiation Safety Technician (CRST) - 5.2.B.7

G. Radiation Site Support (RSS) - 5.2.B.6

H. Plant Chemistry - 5.2.B.8.d

I. Materials Processing Unit (MPU) - 5.2.B.6, 5.3.A

J. Radiation Control - ALARA (RC - A) - 5.2.B.2

5 0 PROCESS

5.1 General

The benefits of minimizing the amount of material, equipment, or components brought into a Radiologically Controlled Area (RCA) include a potential reduction in waste disposal costs; reduction in the need for waste storage; reduction in worker radiation exposure; and an improvement in CCNPPs public image. To help minimize low-level radioactive waste, BGE personnel and contractors should: **[B-3] [B-5] [B-6]**

- Plan work ahead of time.
  - Remove items from containers before carrying them into an RCA.
  - Take only those tools, parts, scaffolding, towels, rags, etc., needed for the job in an RCA.
  - Use tools and equipment which are already stored in an RCA toolroom/Machine Shop.
  - Minimize the amount of liquid products (e.g., oil, paint, solvents) taken into an RCA.

5.2 Dry Active Waste (DAW) Disposal

A. Routine Collection of DAW from Inside an RCA. **[B-4] [B-6]**

1. The Supervisor - Radiation Plant Support (S - RPS) shall, according to the applicable Section/Unit procedure, ensure:

   a. Designated radioactive waste collection containers, usually yellow or magenta, are placed at convenient points within an RCA.

   b. Non-contaminated clean waste collection containers, usually green, are placed near frisking areas and not inside contaminated area boundaries.

   c. Liners or bags, if necessary, are placed inside waste containers to prevent the possible spread of radioactive contamination during transfer of contents.

   d. Routine monitoring and change out of radioactive waste containers and non-contaminated clean waste containers located within RCAs.

5.2 Dry Active Waste (DAW) Disposal (Continued)

(1). Radioactive wet waste (e.g., water soaked rags or paper) is collected, segregated, dried, and transferred to the Materials Processing Facility (MPF) as DAW.

(2). Radioactive oily waste (e.g., oil soaked rags or paper) is collected, segregated, and transferred to the MPF for processing to meet DAW requirements for eventual off site disposal.

(3). Radioactive biological waste is collected, packaged separately from DAW, and transferred to the MPF for processing and eventual off site disposal.

NOTE

Since the MPF is a non-seismic and non-safety-related structure, packages containing gaseous wastes, wastes containing free liquids, solidified wastes, or dewatered waste are not stored in the MPF. **[B-2]**

e. Packaged dry radioactive waste and non-contaminated clean waste removed from collection containers in an RCA are segregated and placed into a metal storage container (i.e., B-25 Metal Box) for transfer to and processing at the MPF.

(1). DAW is placed into a container and marked as radioactive waste.

(2). Dry non-contaminated clean waste is placed into a container marked to indicate that the dry waste is from non-contaminated clean waste collection containers in an RCA.

2. The Supervisor - Materials Processing (S - MP) shall, according to the applicable Section/Unit procedure, ensure:

a. Routine pickup and transfer of containers to the MPF.

(1). DAW received at the MPF is indexed, inventoried, processed to achieve maximum volume reduction (e.g., decontamination, compaction), and assigned a specific storage location until eventual shipment off site for burial or further volume reduction processing (incineration, metal melt).

(a). Radioactive oily waste is processed at the MPF to meet the requirements for disposal as DAW.

(b). Radioactive biological waste, although treated as DAW, is kept separate from other DAW.

(2). Non-contaminated clean waste packages are indexed, opened, and surveyed to prevent inappropriate disposal.

5.2 Dry Active Waste (DAW) Disposal (Continued)

B. Segregation of DAW from a Specific Work Activity Inside an RCA. **[B-4] [B-6]**

1. The Responsible Individual should, before performing work activities in an RCA, contact Radiation Control - ALARA (RC - A) to discuss waste generation associated with the job.

2. RC - A shall determine radioactive waste estimates for work performed in an RCA.

   a. Things to be considered for estimating radioactive waste for each work activity are:

      (1). Plant location.

      (2). Component (s).

      (3). Estimated work activity duration.

      (4). Materials required.

      (5). Past experience.

      (6). Use of consumable, incinerable materials.

3. If possible, the Responsible Individual should, at least twenty four (24) hours prior to the start of the planned work activity, contact the Supervisor - Radiation Plant Support (S - RPS) to discuss the waste collection containers that will be required at the job site as determined by RC - A.

4. The S - RPS shall ensure that appropriate radioactive waste containers and non-contaminated clean waste containers are placed in and around the planned work area, as required.

5. The Responsible Individual shall ensure:

   a. Waste generated from a work activity inside an RCA is segregated and placed in either:

      (1). Compactable DAW Collection Containers.

      - Compactable DAW does not contain liquids, oils, or non-shreddable material.

      (2). Non-Compactable DAW Collection Containers.

      - Non-compactable solid waste (e.g., conduit, piping, structural steel) is kept separate from compactable solid waste.

5.2 **Dry Active Waste (DAW) Disposal** (Continued)

(3). Wet Waste (e.g., water soaked rags or paper) Collection Containers.

- Wet waste is specifically identified and kept separate from DAW.

(4). Oily Waste (e.g., oil soaked rags or paper) Collection Containers.

- Oily waste is kept separate from DAW containers and identified as oily waste.

(5). Non-Contaminated Clean Waste Collection Containers

b. Radioactive material or potentially contaminated waste is placed in the appropriate radioactive waste collection containers.

c. Waste items too large to be placed in the radioactive waste collection containers are wrapped, boxed, or otherwise sealed to confine any radioactive contamination before movement or storage.

(1). Large, sharp, pointed, or heavy objects are packaged separately with sufficient package strength to ensure that packaging does not leak during normal movement or handling.

d. Before removal of waste from a contaminated work area within an RCA, contact:

(1). Radiation Control - Operations (RC - O), if inside the Protected Area.

OR

(2). The Materials Processing Unit (MPU), if in the Materials Processing Facility (MPF) or at the Lake Davies Lay Down Area.

OR

(3). Radiation Site Support (RSS), for all other areas outside the Protected Area.

6. RC - O, MPU, or RSS shall ensure that a qualified BGE Radiation Safety Technician (RST) or Contractor Senior Radiation Safety Technician (CRST) is assigned to survey the waste or waste package.

5.2 Dry Active Waste (DAW) Disposal (Continued)

7. The assigned RST or CRST shall, according to the applicable Section/Unit procedure:

   a. Perform a radiological survey of the waste or waste package.

   b. Ensure that the waste is:

      (1). Properly packaged and sealed, if required.

      (2). Tagged with a form similar to Attachment 1, Radioactive Materials (RAM) Tag.

      (3). Disposed of in the appropriate RCA waste location.

8. The Responsible Individual shall:

   a. For empty paint cans and other paint related material (e.g., paint brush, stir stick) used in an RCA, place items in the designated RCA Dry Paint Storage Locker for disposal, according to MN-3-100, Painting and Other Protective Coatings.

   b. For used oil drained from a system in an RCA, dispose of the oil in the designated Satellite Accumulation Area, according to CH-1-101, Hazardous Waste Management.

NOTE

Disposal of liquid waste (e.g., solvents, oils, soapy liquids), and saltwater may cause a serious hazard to resin beds and damage ion exchangers, if introduced in floor drains in the Auxiliary Building or Containment Building.

   c. For containers of solvents used in an RCA, dispose of the solvent in the designated Satellite Accumulation Area, according to CH-1-101, Hazardous Waste Management.

   d. For disposal of other liquid waste (e.g., soapy liquids, water in hoses or containers) generated in an RCA, contact Plant Chemistry for an analysis of the waste and guidance on proper disposal.

5.2 Dry Active Waste (DAW) Disposal (Continued)

e. For biological waste found in an RCA:

(1). Contact Radiation Control - Operations (RC - O), if inside the Protected Area.

OR

(2). The MPU, if in the MPF or at the Lake Davies Lay Down Area.

OR

(3). Radiation Site Support (RSS), for all other areas outside the Protected Area.

5.3 Wet Solid Radioactive Waste Disposal

A. The Materials Processing Unit shall, according to the applicable Section/Unit procedure, ensure:

1. Wet solid radioactive waste, generated by the normal operation of CCNPP, is:

a. Collected and processed.

b. Stored, if required.

c. Packaged and labeled to comply with applicable shipping regulations and burial site requirements.

d. Eventually shipped off site for burial.

2. The Chemistry Section is provided the appropriate input on wet solid radioactive waste for inclusion in the Semiannual Radioactive Effluents Release Report (consistent with CCNPP Technical Specifications, Section 6.9.1.8). **[B-7]**

5.4 Vendor Services for Waste Processing

A. Contractor supplied services and systems may be used at CCNPP for the processing of radioactive waste. For the operation of such process systems, it may be desirable to use process control measures and procedures developed by the contractor specifically for the system. Therefore, on review and approval, previously addressed process control measures for a particular waste stream may be superseded by contractor supplied measures as appropriate.

1. Prior to the use of any contractor for the processing of radioactive waste at CCNPP, management review of the contractor's process controls and operating procedures shall be performed for the purpose of ensuring a safe operation according to plant procedures and applicable regulatory requirements.

a. The Process Control Program (PCP) shall be implemented by approved Radiation Safety Procedures (RSP).

(1). RSPs shall be written, reviewed, and approved, according to PR-1-101, Preparation and Control of Calvert Cliffs Technical Procedures.

b. PCP changes shall be reviewed by POSRC, according to NS-2-101, Conduct of the Plant Operations and Safety Review Committee (POSRC)/Procedure Review Committee (PRC)/Qualified Reviewer (QR), and submitted to the Nuclear Regulatory Commission (NRC) in the Semiannual Radioactive Effluent Release Report for the period in which the change was made.

c. For the processing of wet solid radioactive waste that is intended to be shipped for disposal to a licensed radioactive waste burial site, additional precautions are to be taken to ensure a final waste product that meets the appropriate waste characteristic requirements for solidification or dewatering. In particular, the following items are to be documented by the contractor (or CCNPP procedures), prior to utilization for wet solid waste processing at CCNPP:

(1). A general description of the wet solid radioactive waste process, which, if applicable, includes:

(a). Type of waste process agent.

(b). Major process equipments and interface with plant equipment.

(c). Type of wastes that can be processed.

(d). Operating parameters.

5.4 Vendor Services for Waste Processing (Continued)

(2). A PCP, if needed, that provides for the verification of the generation of a suitable waste product, including items such as:

(a). Representative sampling.

(b). Laboratory tests to establish waste-to-process medium ratios.

(c). Criteria for evaluating acceptability of laboratory test.

(3). Specifically approved procedures for the operation of the process equipment that will ensure operation within the bounds as determined by the PCP.

(4). Appropriate Quality Verification (QV) hold points and acceptance criteria for evaluating the acceptability of the final waste product.

6.0 BASES

B-1 ANSI N18.7-1976/ANS 3.2 (02/19/86), Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants

B-2 Calvert Cliffs Updated Final Safety Analysis Report (UFSAR), Chapter 11, Section 11.1.2.4, Dry Active Waste (DAW)

B-3 INPO 89-008-1989, August 1989, Control of Tools and Equipment in Radiologically Controlled Areas

B-4 NUREG 800, Standard Review Plan, Appendix 11.4-A, Design Guidance For Temporary Onsite Storage of Low-Level Radioactive Waste

B-5 INPO-90-020, November 1990, Performance Objectives and Criteria for Corporate Evaluations, Section 2.10, Radiological Protection

B-6 Calvert Cliffs Nuclear Power Plant Low-Level Radioactive Waste Minimization Plan

B-7 Calvert Cliffs Nuclear Power Plant Technical Specifications, Section 6.9.1.8, Semiannual Radioactive Effluent Release Report

7.0 RECORDS

A. The following records are generated by use of this procedure:

Radioactive Materials (RAM) Tag

B. Records are controlled according to PR-3-100, Records Management.

ATTACHMENT 1, RADIOACTIVE MATERIALS (RAM) TAG

CAUTION

RADIOACTIVE MATERIAL

Serial No. _____

Material Description: _____

_____

_____

Contamination Level from: ☐ material ☐ outside pkg.

Beta gamma _____ d/m per 100 cm

Alpha _____ d/m per 100 cm

Dose rate (contact) _____ mSv/h (mrem/h)

_____ mGy/h (mrad/h)

Dose Rates (☐ 30 cm (12 inch) ☐ 3')

_____ mSv/h (mrem/h)

_____ mGy/h (mrad/h)

Special Instructions: _____

_____

_____

Surveyor _____ Date: _____

RSP 1-111-1

(09/93)