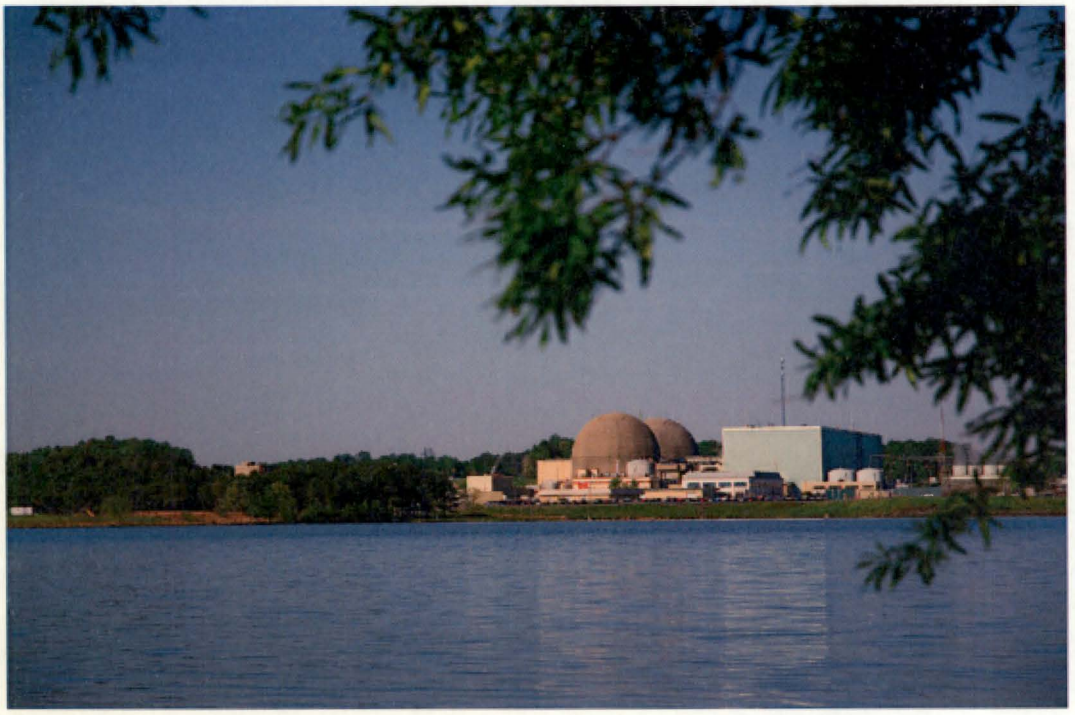
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

NORTH ANNA POWER STATION

(JANUARY 01, 2022 TO DECEMBER 31, 2022)



PREPARED BY: Brad Glasco, R

Supervisor Radiological
Analysis and Instrumentation

APPROVED BY: George R. Simmons

George R. Simmons
Manager
Radiological Protection and Chemistry

FORWARD

This report is submitted in accordance with North Anna Unit 1 and 2 Technical Specification 5.6.3 (10CFR50.36a) and North Anna Independent Spent Fuel Storage Installation (ISFSI) Technical Specification 5.5.2.c and 10CFR72.44(d)(3).

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

FOR THE

NORTH ANNA POWER STATION

JANUARY 01, 2022 TO DECEMBER 31, 2022

INDEX

1.0 EXECUTIVE SUMMARY

The Annual Radioactive Effluent Release Report describes the radioactive effluent control program conducted at the North Anna Power Station and the Independent Spent Fuel Storage Installation (ISFSI) during the 2022 calendar year. This document summarizes the quantities of radioactive liquid and gaseous effluents and solid waste released from the North Anna Power Station and ISFSI in accordance with Regulatory Guide 1.21 during the period of January 1 through December 31, 2022 and includes an assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents. There were no releases from the ISFSI during 2022.

There were no unplanned releases, meeting the reporting criteria of Section 6.7.2.a.3 of the Offsite Dose Calculation Manual during this reporting period. Also, there were no spills or leaks meeting the voluntary communication criteria of the NEI Ground Water Protection Initiative. This will be discussed in Attachment 6.

10 CFR 50, Appendix I dose calculations were performed on the 2022 effluent release data in accordance with the Offsite Dose Calculation Manual. The results of these pathway dose calculations indicate the following:

a. The total body dose due to liquid effluents was 8.738E-01 mrem, which is 14.563% of the dose limit, and the critical organ dose due to liquid effluents was 8.790E-01 mrem, which is 4.395% of the dose limit.

b. The air dose due to noble gases was 6.711E-05 mrad gamma, which is 3.356E-04% of the annual gamma dose limit, and 3.790E-05 mrad beta, which is 9.475E-05% of the annual beta dose limit.

c. The critical organ dose for I-131, I-133, H-3, and particulates with half-lives greater than 8 days including C-14 was 1.079E+0 mrem, which is 3.60% of the annual dose limit. The bases of C-14 calculations are described in Attachment 9.

d. The critical organ dose for I-131, I-133, H-3, and particulates with half-lives greater than 8 days not including C-14 was 7.977E-03 mrem, which is 2.659E-02% of the annual dose limit.

There were no major changes to either the radioactive liquid waste treatment system, or to the gaseous, and solid waste treatment systems during this reporting period.

There was no revision to the Offsite Dose Calculation Manual during this reporting period.

Based on the levels of radioactivity observed during this reporting period and the dose calculations performed, the operations of the North Anna Nuclear Power Station Units 1 and 2 and ISFSI have resulted in negligible dose consequences to the maximum exposed member of the public in unrestricted areas.

2.0 PURPOSE AND SCOPE

The Radioactive Effluent Release Report includes, in Attachment 1, a summary of the quantities of radioactive liquid and gaseous effluents and solid waste as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants", Revision 1, June 1974, with data summarized on a quarterly basis for Table 1 and 2 and on an annual basis on Table 3. The report submitted before May 1st of each year includes an assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site during the previous calendar year. The report also includes a list of unplanned releases during the reporting period in Attachment 6.

As required by Technical Specification, any changes to the Offsite Dose Calculation Manual (ODCM) for the time period covered by this report are included in Attachment 3.

Major changes to radioactive liquid, gaseous and solid waste treatment systems are reported in Attachment 4, as required by the ODCM, Section 6.7.2.a.4. Information to support the reason(s) for the change(s) and a summary of the 10 CFR 50.59 evaluation are included.

As required by the ODCM, Sections 6.2.2.b.2 and 6.3.2.b.3, a list and explanation for the inoperability of radioactive liquid and/or gaseous effluent monitoring instrumentation is provided in Attachment 5 of this report.

3.0 DISCUSSION

The basis for the calculation of percent of Technical Specification for the critical organ in Table 1A of Attachment 1 is the ODCM, section 6.3.1, which requires that the dose rate for iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days be less than or equal to 1500 mrem/yr to the critical organ at or beyond the site boundary.

The basis for the calculation of percent of Technical Specification for the total body and skin in Table 1A of Attachment 1 is the ODCM, section 6.3.1, which requires that the dose rate for noble gases to areas at or beyond the site boundary shall be less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin.

The beta and gamma air doses due to noble gases released from the site were calculated at site boundary. The maximum exposed member of the public from the releases of airborne iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days, including carbon-14 is defined as a child, exposed through the vegetation pathway, with the critical organ being the bone. If carbon-14 is excluded from these calculations, the maximum exposed member of the public from the releases of airborne iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days is defined as a child, exposed through the vegetation pathway, with the critical organ being the thyroid gland.

The basis for the calculation of the percent of Technical Specification in Table 2A in Attachment 1 is the ODCM, section 6.2.1, which states that the concentrations of radioactive material released in liquid effluents to unrestricted areas shall be limited to 10 times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 uCi/ml.

The maximum exposed member of the public for calculation of total body dose from radioactive materials in liquid effluents released to unrestricted areas is defined as a child. The critical organ dose calculation was determined to be the child liver. The age group is exposed via the drinking water and fish ingestion pathways.

As shown in Attachment 6, there were no unplanned releases meeting the requirements of 6.7.2.a.3 of the ODCM.

The typical Lower Limit of Detection (LLD) capabilities of the radioactive effluent analysis instrumentation are presented in Attachment 7. These LLD values are based upon conservative conditions (i.e., minimum sample volume and maximum delay time prior to analysis). Actual LLD values may be lower. If a radioisotope was not detected when effluent samples were analyzed, then the activity of that radioisotope was reported as Not Detectable (N/D) on Attachment 1 of this report. If an analysis for an isotope was not performed, then the activity was reported as Not Applicable (N/A).

4.0 SUPPLEMENTAL INFORMATION

As required by the ODCM, section 6.6.2, evaluation of the Land Use Census is performed to identify if new location(s) need be added for the radiological environmental monitoring program pursuant to the ODCM. There were no new sampling locations added. There were five (5) changes made from the land use census in 2022. The nearest resident location in the ESE sector changed from 1.70 miles to 1.53 miles. The physical address of the nearest garden location in the ESE sector changed , however, the location remained at 1.70 miles. The nearest garden location in the SE sector changed from 1.40 miles to 1.90 miles. The nearest resident in the SW sector changed from 1.65 miles to 1.56 miles. Finally, the nearest garden location in the W sector changed from 1.93 miles to 1.96 miles.

Section 6.6.1.b.4 of the ODCM requires identification of the cause(s) for the unavailability of milk or leafy vegetation samples, and the identification of new locations for obtaining replacement samples. Milk samples were not collected in 2022 because the last of the operating dairies in the sampling area ceased operations at the start of calendar year 2018. Vegetation samples were not collected from stations 14B, 15, 16, 23 and 26 from January through March and November through December due to seasonal unavailability. All other vegetation samples were obtained.

Attachment 8 contains the results of samples associated with ground water protection sampling undertaken at North Anna to voluntarily comply with the Nuclear Energy Institute, NEI, Ground Water Protection Initiative. In addition to the well, river, and surface water samples included as part of the Radiological Environmental Monitoring Program, North Anna obtained subsurface water samples from various locations on the site.

Attachment 9 contains an explanation of the bases for the carbon-14 calculations performed to assess doses due to carbon-14. Doses and %TS for gaseous releases are displayed with C-14 included and without for comparison of the values.

ATTACHMENT 1

EFFLUENT RELEASE DATA

(01/22 - 12/22)

This attachment includes a summary of the quantities of radioactive liquid and gaseous effluents and solid waste, as outlined in Regulatory Guide 1.21, Appendix B, except that in accordance with Step 6.7.2.a.1 of the ODCM liquid and gaseous data is summarized on a quarterly basis and solid waste is summarized on an annual basis.

TABLE 1A
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
SUMMATION OF ALL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

	UNITS	1 ST QUARTER	2 ND QUARTER	ESTIMATED TOTAL PERCENT ERROR (%)
A. Fission and Activiation Gases:				
1. Total Release	Curies	1.17E-01	3.18E-02	1.80E+1
2. Average Release Rate For Period	µCi/sec	1.50E-02	4.04E-03	
B. Iodines:				
1. Total Iodine-131 Release	Curies	N/D	N/D	2.80E+1
2. Average Release Rate For Period	µCi/sec	N/D	N/D	
C. Particulate ($T_{1/2}$ > 8 days):				
1. Total Particulate ($T_{1/2}$ > 8 days) Release	Curies	2.56E-05	1.32E-06	2.80E+1
2. Average Release Rate For Period	µCi/sec	3.29E-06	1.68E-07	
3. Gross Alpha Radioactivity Release	Curies	N/D	N/D	
D. Tritium:				
1. Total Release	Curies	2.97E+00	1.19E+00	3.10E+1
2. Average Release Rate For Period	µCi/sec	3.82E-01	1.52E-01	
E. Carbon-14				
1. Total Release	Curies	1.28E+01	3.47E+00	
2. Average Release Rate For Period	µCi/sec	1.65E+00	4.41E-01	
F. Percentage Of Technical Specification Limits				
1. Total Body Dose Rate	%	2.56E-06	4.24E-05	
2. Skin Dose Rate	%	9.87E-07	1.03E-05	
3. Critical Organ Dose Rate (with C-14)	%	8.11E-03	6.41E-03	
Critical Organ Dose Rate (without C-14)	%	2.55E-04	6.75E-05	

TABLE 1A
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
SUMMATION OF ALL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

	UNITS	3 RD QUARTER	4 TH QUARTER	ESTIMATED TOTAL PERCENT ERROR (%)
A. Fission and Activiation Gases:				
1. Total Release	Curies	8.22E-02	1.28E-02	1.80E+1
2. Average Release Rate For Period	µCi/sec	1.03E-02	1.61E-03	
B. Iodines:				
1. Total Iodine-131 Release	Curies	N/D	N/D	2.80E+1
2. Average Release Rate For Period	µCi/sec	N/D	N/D	
C. Particulate ($T_{1/2}$ > 8 days):				
1. Total Particulate ($T_{1/2}$ > 8 days) Release	Curies	1.10E-05	0.00E+00	2.80E+1
2. Average Release Rate For Period	µCi/sec	1.38E-06	0.00E+00	
3. Gross Alpha Radioactivity Release	Curies	N/D	N/D	
D. Tritium:				
1. Total Release	Curies	1.25E+01	3.17E+00	3.10E+1
2. Average Release Rate For Period	µCi/sec	1.58E+00	3.99E-01	
F. Carbon-14				
1. Total Release	Curies	8.98E+00	1.39E+00	
2. Average Release Rate For Period	µCi/sec	1.13E+00	1.75E-01	
F. Percentage Of Technical Specification Limits				
1. Total Body Dose Rate	%	5.16E-06	6.12E-07	
2. Skin Dose Rate	%	1.54E-06	1.65E-07	
3. Critical Organ Dose Rate (with C-14)	%	6.95E-03	5.12E-04	
Critical Organ Dose Rate (without C-14)	%	1.06E-03	2.70E-04	

TABLE 1B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
MIXED MODE GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Fission & Activation Gases:					
Krypton - 85	Ci	N/D	N/D	N/D	N/D
Krypton - 85m	Ci	N/D	N/D	N/D	N/D
Krypton - 87	Ci	N/D	N/D	N/D	N/D
Krypton - 88	Ci	N/D	N/D	N/D	N/D
Xenon - 131m	Ci	N/D	N/D	N/D	N/D
Xenon - 133	Ci	N/D	N/D	9.62E-02	3.91E-03
Xenon - 133m	Ci	N/D	N/D	5.39E-04	N/D
Xenon - 135	Ci	N/D	N/D	7.83E-03	4.82E-05
Xenon - 135m	Ci	N/D	N/D	N/D	N/D
Xenon - 137	Ci	N/D	N/D	N/D	N/D
Xenon - 138	Ci	N/D	N/D	N/D	N/D
Argon - 41	Ci	N/D	6.34E-03	N/D	2.35E-03
Total For Period	Ci	N/D	6.34E-03	1.05E-01	6.31E-03
Iodines:					
Iodine - 130	Ci	N/D	N/D	N/D	N/D
Iodine - 131	Ci	N/D	N/D	N/D	N/D
Iodine - 132	Ci	N/D	N/D	N/D	N/D
Iodine - 133	Ci	N/D	N/D	N/D	N/D
Iodine - 134	Ci	N/D	N/D	N/D	N/D
Iodine - 135	Ci	N/D	N/D	N/D	N/D
Br-82	Ci	1.13E-07	1.84E-07		
Total For Period	Ci	1.13E-07	1.84E-07	N/D	N/D
Particulates:					
Manganese - 54	Ci	N/D	N/D	N/D	N/D
Cobalt - 58	Ci	N/D	N/D	N/D	N/D
Iron - 59	Ci	N/D	N/D	N/D	N/D
Cobalt - 60	Ci	N/D	N/D	N/D	N/D
Zinc - 65	Ci	N/D	N/D	N/D	N/D
Strontium - 89	Ci	N/D	N/D	N/D	N/D
Strontium - 90	Ci	N/D	N/D	N/D	N/D
Cesium - 134	Ci	N/D	N/D	N/D	N/D
Cesium - 136	Ci	N/D	N/D	N/D	N/D
Cesium - 137	Ci	N/D	N/D	N/D	N/D

TABLE 1B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
MIXED MODE GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Particulates: (cont.)					
As-76	Ci	2.16E-07	8.67E-07	N/D	N/D
Cerium - 141	Ci	N/D	N/D	N/D	N/D
Cerium - 144	Ci	N/D	N/D	N/D	N/D
Ag-110m	Ci	N/D	7.66E-09	N/D	N/D
Total for Period (T1/2 > 8 days)	Ci	N/D	7.66E-09	N/D	N/D
Total for Period (T1/2 < 8 days)	Ci	2.16E-07	8.67E-07	N/D	N/D
Total For Period	Ci	2.16E-07	8.75E-07	N/D	N/D
GROSS ALPHA:	Ci	N/D	N/D	N/D	N/D
TRITIUM:	Ci	1.53E-01	5.01E-01	4.94E-03	5.57E-04
CARBON-14	Ci	N/D	6.93E-01	1.15E+01	6.89E-01

TABLE 1B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
MIXED MODE GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Fission & Activation Gases:					
Krypton - 85	Ci	N/D	N/D	N/D	N/D
Krypton - 85m	Ci	N/D	N/D	N/D	N/D
Krypton - 87	Ci	N/D	N/D	N/D	N/D
Krypton - 88	Ci	N/D	N/D	N/D	N/D
Xenon - 131m	Ci	N/D	N/D	N/D	N/D
Xenon - 133	Ci	3.48E-02	N/D	2.11E-02	1.08E-02
Xenon - 133m	Ci	N/D	N/D	N/D	N/D
Xenon - 135	Ci	N/D	N/D	5.77E-04	4.25E-05
Xenon - 135m	Ci	N/D	N/D	N/D	N/D
Xenon - 137	Ci	N/D	N/D	N/D	N/D
Xenon - 138	Ci	N/D	N/D	N/D	N/D
Argon - 41	Ci	1.07E-02	N/D	1.11E-03	1.92E-03
Total For Period	Ci	4.55E-02	N/D	2.28E-02	1.28E-02
Iodines:					
Iodine - 130	Ci	N/D	N/D	N/D	N/D
Iodine - 131	Ci	N/D	N/D	N/D	N/D
Iodine - 132	Ci	N/D	N/D	N/D	N/D
Iodine - 133	Ci	N/D	N/D	N/D	N/D
Iodine - 134	Ci	N/D	N/D	N/D	N/D
Iodine - 135	Ci	N/D	N/D	N/D	N/D
Bromine-82	Ci	5.52E-08	N/D	N/D	N/D
Total For Period	Ci	5.52E-08	N/D	N/D	N/D
Particulates:					
Manganese - 54	Ci	N/D	N/D	N/D	N/D
Cobalt - 58	Ci	N/D	N/D	N/D	N/D
Iron - 59	Ci	N/D	N/D	N/D	N/D
Cobalt - 60	Ci	N/D	N/D	N/D	N/D
Zinc - 65	Ci	N/D	N/D	N/D	N/D
Strontium - 85	Ci	N/D	N/D	N/D	N/D
Strontium - 89	Ci	N/D	N/D	N/D	N/D
Strontium - 90	Ci	N/D	N/D	N/D	N/D
Silver-110m	Ci	N/D	N/D	N/D	N/D
Cesium - 134	Ci	N/D	N/D	N/D	N/D
Cesium - 137	Ci	N/D	N/D	N/D	N/D

TABLE 1B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
MIXED MODE GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Particulates: (cont.)					
Arsenic - 76	Ci	1.10E-07	N/D	N/D	N/D
Cerium - 141	Ci	N/D	N/D	N/D	N/D
Cerium - 144	Ci	N/D	N/D	N/D	N/D
Total for Period (T1/2 > 8 days)	Ci	N/D	N/D	N/D	N/D
Total for Period (T1/2 < 8 days)	Ci	1.10E-07	N/D	N/D	N/D
Total For Period	Ci	1.10E-07	N/D	N/D	N/D
GROSS ALPHA:	Ci	N/D	N/D	N/D	N/D
TRITIUM:	Ci	5.48E-01	1.25E-01	3.47E-03	1.34E-03
CARBON-14	Ci	4.97E+00	N/D	2.49E+00	1.39E+00

TABLE 1C
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
GROUND LEVEL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Fission & Activation Gases:					
Krypton - 85	Ci	N/D	N/D	N/D	N/D
Krypton - 85m	Ci	N/D	N/D	N/D	N/D
Krypton - 87	Ci	N/D	N/D	N/D	N/D
Krypton - 88	Ci	N/D	N/D	N/D	N/D
Xenon - 131m	Ci	N/D	N/D	N/D	N/D
Xenon - 133	Ci	N/D	N/D	1.13E-02	N/D
Xenon - 133m	Ci	N/D	N/D	8.85E-05	N/D
Xenon - 135	Ci	N/D	N/D	1.02E-03	N/D
Xenon - 135m	Ci	N/D	N/D	N/D	N/D
Xenon - 137	Ci	N/D	N/D	N/D	N/D
Xenon - 138	Ci	N/D	N/D	N/D	N/D
Argon - 41	Ci	N/D	N/D	3.31E-06	1.91E-02
Total For Period	Ci	N/D	N/D	1.24E-02	1.91E-02
Iodines:					
Iodine - 130	Ci	N/D	N/D	N/D	N/D
Iodine - 131	Ci	N/D	N/D	N/D	N/D
Iodine - 132	Ci	N/D	N/D	N/D	N/D
Iodine - 133	Ci	N/D	N/D	N/D	N/D
Iodine - 134	Ci	N/D	N/D	N/D	N/D
Iodine - 135	Ci	N/D	N/D	N/D	N/D
Total For Period	Ci	N/D	N/D	N/D	N/D
Particulates:					
Manganese - 54	Ci	N/D	N/D	N/D	N/D
Cobalt - 58	Ci	9.81E-06	N/D	N/D	N/D
Iron - 59	Ci	N/D	N/D	N/D	N/D
Cobalt - 60	Ci	1.03E-05	1.31E-06	N/D	N/D
Zinc - 65	Ci	N/D	N/D	N/D	N/D
Strontium - 89	Ci	N/D	N/D	N/D	N/D
Strontium - 90	Ci	N/D	N/D	N/D	N/D
Cesium - 134	Ci	N/D	N/D	N/D	N/D

TABLE 1C
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
GROUND LEVEL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Particulates: (cont.)					
Cesium - 137	Ci	1.97E-06	N/D	N/D	N/D
Arsenic-76 (T1/2 < 8 days)	Ci	N/D	4.73E-05	N/D	N/D
Rubidium-88	Ci	N/D	N/D	N/D	N/D
Cerium - 144	Ci	N/D	N/D	N/D	N/D
Niobium-95	Ci	3.55E-06	N/D	N/D	N/D
Zirconium-95	Ci	N/D	N/D	N/D	N/D
Tellurium-131m (T1/2 < 8 days)	Ci	N/D	N/D	N/D	N/D
Yttrium-91m (T1/2 < 8 days)	Ci	N/D	N/D	N/D	N/D
Chromium-51	Ci	N/D	N/D	N/D	N/D
Total for Period (T1/2 > 8 days)	Ci	2.56E-05	1.31E-06	N/D	N/D
Total for Period (T1/2 < 8 days)	Ci	N/D	4.73E-05	N/D	N/D
Total For Period	Ci	2.56E-05	4.86E-05	N/D	N/D
GROSS ALPHA:	Ci	N/D	N/D	N/D	N/D
TRITIUM:	Ci	N/D	N/D	2.81E+00	6.93E-01
CARBON-14	Ci	N/D	N/D	1.35E+00	2.09E+00

TABLE 1C
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
GROUND LEVEL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Fission & Activation Gases:					
Krypton - 85	Ci	N/D	N/D	N/D	N/D
Krypton - 85m	Ci	N/D	N/D	3.37E-06	N/D
Krypton - 87	Ci	N/D	N/D	N/D	N/D
Krypton - 88	Ci	N/D	N/D	N/D	N/D
Xenon - 131m	Ci	N/D	N/D	N/D	N/D
Xenon - 133	Ci	N/D	N/D	1.25E-02	N/D
Xenon - 133m	Ci	N/D	N/D	2.90E-04	N/D
Xenon - 135	Ci	N/D	N/D	1.09E-03	N/D
Xenon - 135m	Ci	N/D	N/D	N/D	N/D
Xenon-137	Ci	N/D	N/D	N/D	N/D
Xenon - 138	Ci	N/D	N/D	N/D	N/D
Argon - 41	Ci	N/D	N/D	7.15E-05	N/D
Total For Period	Ci	N/D	N/D	1.39E-02	N/D
Iodines:					
Iodine - 130	Ci	N/D	N/D	N/D	N/D
Iodine - 131	Ci	N/D	N/D	N/D	N/D
Iodine - 132	Ci	N/D	N/D	N/D	N/D
Iodine - 133	Ci	N/D	N/D	N/D	N/D
Iodine - 134	Ci	N/D	N/D	N/D	N/D
Iodine - 135	Ci	N/D	N/D	N/D	N/D
Total For Period	Ci	N/D	N/D	N/D	N/D
Particulates:					
Manganese - 54	Ci	N/D	N/D	N/D	N/D
Cobalt - 58	Ci	N/D	N/D	N/D	N/D
Iron - 59	Ci	N/D	N/D	N/D	N/D
Cobalt - 60	Ci	1.10E-05	N/D	N/D	N/D
Zinc - 65	Ci	N/D	N/D	N/D	N/D
Strontium - 89	Ci	N/D	N/D	N/D	N/D
Strontium - 90	Ci	N/D	N/D	N/D	N/D
Cesium - 134	Ci	N/D	N/D	N/D	N/D

TABLE 1C
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
GROUND LEVEL GASEOUS EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Particulates: (cont.)					
Cesium - 137	Ci	N/D	N/D	N/D	N/D
Niobium-95 (T1/2 > 8 days)	Ci	N/D	N/D	N/D	N/D
Ag-110m (T1/2 > 8 days)	Ci	N/D	N/D	N/D	N/D
Other (Specify)					
Total for Period (T1/2 > 8 days)	Ci	1.10E-05	N/D	N/D	N/D
Total for Period (T1/2 < 8 days)	Ci	N/D	N/D	N/D	N/D
Total For Period	Ci	1.10E-05	N/D	N/D	N/D
GROSS ALPHA:	Ci	N/D	N/D	N/D	N/D
TRITIUM:	Ci	1.04E+01	2.53E+00	1.55E+00	5.15E-01
CARBON-14	Ci	N/D	N/D	1.52E+00	3.91E-03

TABLE 2A
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT - SUMMATION OF ALL RELEASES FOR (01/22 - 12/22)

	UNITS	1 ST QUARTER	2 ND QUARTER	ESTIMATED TOTAL PERCENT ERROR (%)
A. Fission and Activiation Products:				
1. Total Release (not including tritium, noble gas, and gross alpha).	Curies	5.03E-03	3.21E-03	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	1.71E-11	4.33E-12	
3. Percent of applicable limit (T.S.)	%	2.39E-05	7.37E-06	
B. Tritium:				
1. Total release activity.	Curies	9.37E+02	5.87E+02	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	3.18E-06	7.92E-07	
3. Percent of applicable limit (T.S.)	%	3.18E-02	7.92E-03	
C. Dissolved and Entrained Gases:				
1. Total release activity.	Curies	N/D	N/D	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	N/D	N/D	
3. Percent of applicable limit (T.S.)	%	N/D	N/D	
D. Gross Alpha Radioactivity:				
1. Total release activity.	Curies	N/D	N/D	2.00E+01
E. Volume of waste released: (prior to dilution).	Liters	9.90E+07	8.85E+07	3.00E+00
F. Total volume of dilution water used during the period.	Liters	2.95E+11	7.42E+11	3.00E+00

TABLE 2A
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT - SUMMATION OF ALL RELEASES FOR (01/22 - 12/22)

	UNITS	3 RD QUARTER	4 TH QUARTER	ESTIMATED TOTAL PERCENT ERROR (%)
A. Fission and Activiation Products:				
1. Total Release (not including tritium, noble gas, and gross alpha).	Curies	2.81E-03	2.33E-03	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	3.77E-12	4.04E-12	
3. Percent of applicable limit (T.S.)	%	7.01E-06	5.41E-06	
B. Tritium:				
1. Total release activity.	Curies	6.95E+02	2.56E+02	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	9.32E-07	4.43E-07	
3. Percent of applicable limit (T.S.)	%	9.32E-03	4.43E-03	
C. Dissolved and Entrained Gases:				
1. Total release activity.	Curies	N/D	N/D	2.00E+01
2. Average diluted concentration during the period.	µCi/ml	N/D	N/D	
3. Percent of applicable limit (T.S.)	%	N/D	N/D	
D. Gross Alpha Radioactivity:				
1. Total release activity.	Curies	N/D	N/D	2.00E+01
E. Volume of waste released: (prior to dilution).	Liters	8.20E+07	1.02E+08	3.00E+00
F. Total volume of dilution water used during the period.	Liters	7.46E+11	5.78E+11	3.00E+00

TABLE 2B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Fission & Activation Products:					
Manganese - 54	Ci	1.38E-04	N/D	N/A	N/A
Iron - 59	Ci	N/D	N/D	N/A	N/A
Cobalt - 58	Ci	3.26E-03	1.66E-03	N/A	N/A
Cobalt - 60	Ci	1.59E-03	8.99E-04	N/A	N/A
Strontium - 89	Ci	N/D	N/D	N/A	N/A
Strontium - 90	Ci	N/D	N/D	N/A	N/A
Tellurium-123m	Ci	N/D	1.47E-04	N/A	N/A
Tellurium-132	Ci	2.47E-05	N/D	N/A	N/A
Chromium-51	Ci	N/D	N/D	N/A	N/A
Iodine - 131	Ci	N/D	N/D	N/A	N/A
Iodine - 133	Ci	N/D	N/D	N/A	N/A
Cesium - 134	Ci	N/D	N/D	N/A	N/A
Cesium - 137	Ci	N/D	1.36E-04	N/A	N/A
Zirconium - 95	Ci	N/D	N/D	N/A	N/A
Cerium - 141	Ci	N/D	N/D	N/A	N/A
Silver-110m	Ci	2.15E-05	N/D	N/A	N/A
Tellurium-125m	Ci	N/D	7.02E-05	N/A	N/A
Niickel - 63 (T1/2 > 8 days)	Ci	N/D	N/D	N/A	N/A
Antimony-125	Ci	N/D	3.04E-04	N/A	N/A
Total for Period	Ci	5.03E-03	3.21E-03	N/A	N/A

TABLE 2B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER
Dissolved & Entrained Noble Gases:					
Xenon - 133	Ci	N/D	N/D	N/A	N/A
Xenon - 133m	Ci	N/D	N/D	N/A	N/A
Xenon - 135	Ci	N/D	N/D	N/A	N/A
Xenon - 135m	Ci	N/D	N/D	N/A	N/A
Other (Specify)	Ci	N/D	N/D	N/A	N/A
Krypton-88 (T1/2 < 8 days)	Ci	N/D	N/D	N/A	N/A
Krypton-85 (T1/2 > 8 days)	Ci	N/D	N/D	N/A	N/A
Total for Period	Ci	N/D	N/D	N/A	N/A
Tritium	Ci	9.37E+02	5.87E+02	N/A	N/A
Gross Alpha	Ci	N/D	N/D	N/A	N/A

TABLE 2B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Fission & Activation Products:					
Manganese - 54	Ci	N/D	N/D	N/A	N/A
Iron - 59	Ci	N/D	N/D	N/A	N/A
Cobalt - 58	Ci	1.69E-03	1.52E-03	N/A	N/A
Cobalt - 60	Ci	9.63E-04	6.60E-04	N/A	N/A
Strontium - 89	Ci	N/D	N/D	N/A	N/A
Strontium - 90	Ci	N/D	N/D	N/A	N/A
Niobium - 95	Ci	N/D	N/D	N/A	N/A
Zirconium - 95	Ci	N/D	N/D	N/A	N/A
Silver - 110m	Ci	N/D	N/D	N/A	N/A
Iodine - 131	Ci	N/D	N/D	N/A	N/A
Iodine - 133	Ci	N/D	N/D	N/A	N/A
Cesium - 134	Ci	N/D	N/D	N/A	N/A
Cesium - 137	Ci	1.13E-04	1.12E-05	N/A	N/A
Tellurium-123m	Ci	4.82E-05	N/D	N/A	N/A
Cerium - 141	Ci	N/D	N/D	N/A	N/A
Chromium-51	Ci	N/D	N/D	N/A	N/A
Nickel - 63 (T1/2 > 8 days)	Ci	N/D	N/D	N/A	N/A
Ruthenium-105 (T1/2 < 8 days)	Ci	N/D	N/D	N/A	N/A
Antimony-125 (T1/2 > 8 days)	Ci	N/D	1.12E-04	N/A	N/A
Antimony-122 (T1/2 > 8 days)	Ci	N/D	N/D	N/A	N/A
Tellurium-125m (T1/2 > 8 days)	Ci	N/D	2.58E-05	N/A	N/A
Total for Period	Ci	2.81E-03	2.33E-03	N/A	N/A

TABLE 2B
NORTH ANNA POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
LIQUID EFFLUENT RELEASES FOR (01/22 - 12/22)

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
Dissolved & Entrained Noble Gases:					
Xenon - 133	Ci	N/D	N/D	N/A	N/A
Xenon - 133m	Ci	N/D	N/D	N/A	N/A
Xenon - 135	Ci	N/D	N/D	N/A	N/A
Xenon - 135m	Ci	N/D	N/D	N/A	N/A
Other (Specify)					
Argon - 41 (T1/2 < 8 days)	Ci	N/D	N/D	N/A	N/A
Krypton - 85 (T1/2 > 8 days)	Ci	N/D	N/D	N/A	N/A
Total for Period	Ci	N/D	N/D	N/A	N/A
Tritium	Ci	6.95E+02	2.56E+02	N/A	N/A
Gross Alpha	Ci	N/D	N/D	N/A	N/A

TABLE 3
NORTH ANNA POWER STATION
RADIOACTIVE EFFLUENT RELEASE REPORT
SUMMATION OF SOLID RADIOACTIVE WASTE AND IRRADIATED FUEL SHIPMENTS
FOR 01-01-22 THROUGH 12-31-22

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)				
1. Type of Waste	Unit	12-Month Period		Estimated Total Percent Error (%)
a. Spent resins, sludges, filters sludge, evaporator bottoms, etc.,	m^3	1.17E+01	*	2.50E+01
	Ci	1.53E+02		2.50E+01
b. Dry compressible waste, contaminated equipment, etc.,	m^3	2.05E+02	**	2.50E+01
	Ci	1.78E-01		2.50E+01
c. Irradiated components, control rods, etc.,	m^3	0.00E+00	***	2.50E+01
	Ci	0.00E+00		2.50E+01
d. Other (describe)				
Used oil/Blast media/Sewage/Gravel	m^3	4.20E-01	****	2.50E+01
Dessicant/Soil/Construction debris	Ci	3.78E-03		2.50E+01
Animal Carcasses				

2. Estimate of major nuclide composition (by type of waste)	(%)	(Ci)	Estimated Total Percent Error (%)
a. Co-60	5.74E+01	8.75E+01	2.50E+01
Ni-63	2.42E+01	3.68E+01	2.50E+01
Fe-55	6.23E+00	9.50E+00	2.50E+01
Mn-54	3.70E+00	5.65E+00	2.50E+01
Co-58	3.35E+00	5.10E+00	2.50E+01
Sb-125	1.54E+00	2.35E+00	2.50E+01
Cs-137	1.07E+00	1.64E+00	2.50E+01
Zn-65	6.60E-01	1.01E+00	2.50E+01
Be-7	6.30E-01	9.61E-01	2.50E+01
Ag-110m	2.36E-01	3.60E-01	2.50E+01
Ni-59	2.35E-01	3.59E-01	2.50E+01
H-3	1.67E-01	2.54E-01	2.50E+01
Nb-95	1.65E-01	2.52E-01	2.50E+01
b. Co-60	4.72E+01	8.45E-02	2.50E+01
Co-58	1.66E+01	2.96E-02	2.50E+01
Cr-51	8.20E+00	1.46E-02	2.50E+01
Nb-95	6.93E+00	1.24E-02	2.50E+01
Fe-55	6.49E+00	1.16E-02	2.50E+01
Ni-63	3.93E+00	7.01E-03	2.50E+01
Zr-95	3.88E+00	6.93E-03	2.50E+01
Cs-137	2.94E+00	5.25E-03	2.50E+01
Sb-125	1.62E+00	2.89E-03	2.50E+01
Mn-54	1.31E+00	2.33E-03	2.50E+01
Ag-110m	2.12E-01	3.78E-04	2.50E+01
Fe-59	1.26E-01	2.25E-04	2.50E+01
H-3	1.23E-01	2.19E-04	2.50E+01
Te-125m	9.84E-02	1.76E-04	2.50E+01
c. NONE			
d. Co-60	5.11E+01	1.93E-03	2.50E+01
Ni-63	2.22E+01	8.40E-04	2.50E+01
Cs-137	1.61E+01	6.10E-04	2.50E+01
H-3	8.70E+00	3.29E-04	2.50E+01
Sb-125	8.89E-01	3.36E-05	2.50E+01
Cs-134	1.83E-01	7.66E-06	2.50E+01
Mn-54	1.17E-01	6.91E-06	2.50E+01

TABLE 3
NORTH ANNA POWER STATION
RADIOACTIVE EFFLUENT RELEASE REPORT
SUMMATION OF SOLID RADIOACTIVE WASTE
AND IRRADIATED FUEL SHIPMENTS
01-01-22 THROUGH 12-31-22

3. **Solid Waste Disposition**

Number of Shipments	Mode of Transportation	Destination
6	Truck	Oak Ridge, TN
1	Truck	Andrews, TX

Note: Some of the 7 solid waste shipments contained multiple waste types and are therefore listed in more than one category below.

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
0	N/A	N/A

* (2) shipments containing resins were shipped to a licensed waste processor for final dewatering and disposal.
(1) shipment containing resins was shipped to a licensed waste facility for disposal.
(1) shipment containing mechanical filters was shipped to a licensed waste processor for processing.
(1) shipment containing mechanical filters was shipped to a licensed waste facility for disposal.

** (4) shipments containing dry compactible waste were shipped to a licensed waste processor for processing.
(1) shipment containing low activity calibration standards was shipped to a licensed waste facility for disposal.

*** None

**** (1) shipment containing waste oil was shipped to a licensed waste processor for processing.
(1) shipment containing sludge was shipped to a licensed waste processor for processing.

ATTACHMENT 2

ANNUAL AND QUARTERLY DOSES

(01/22 - 12/22)

An assessment of radiation doses to the maximum exposed member of the public due to radioactive liquid and gaseous effluents released from the site for each calendar quarter for the calendar year of this report, along with an annual total of each effluent pathway will be made as required by ODCM Section 6.7.2.

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Total
Total Body Dose (mrem)	3.305E-1	2.076E-1	2.454E-1	9.034E-2	8.738E-1
Critical Organ Dose (mrem)	3.306E-1	2.103E-1	2.475E-1	9.058E-2	8.790E-1

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Total
Noble Gas Gamma Dose (mrad)	3.639E-6	5.552E-5	7.120E-6	8.310E-7	6.711E-5
Noble Gas Beta Dose (mrad)	8.879E-6	1.972E-5	8.616E-6	6.846E-7	3.790E-5
Critical Organ (Child bone) Dose for I-131, I-133, H-3, Particulates with T½ > 8 days (including C-14) (mrem)	5.420E-1	2.970E-1	1.933E-1	4.624E-2	1.079E+0
Critical Organ (Child thyroid) Dose for I-131, I-133, H-3, Particulates with T½ > 8 days (excluding C-14) (mrem)	1.222E-3	3.527E-4	5.109E-3	1.293E-3	7.977E-3

ATTACHMENT 3

REVISIONS TO OFFSITE DOSE CALCULATION MANUAL

(ODCM)

(01/22 - 12/22)

As required by Technical Specification 5.5.1.c, revisions to the ODCM, effective for the time period covered by this report, are summarized in this attachment.

There was no revision to the ODCM during this reporting period.

ATTACHMENT 4

MAJOR CHANGES TO RADIOACTIVE LIQUID, GASEOUS, AND SOLID WASTE TREATMENT SYSTEMS

(01/22 - 12/22)

As required by the ODCM, Section 6.7.2.a.4, major changes to radioactive liquid, gaseous and solid waste treatment systems for the time period covered by this report are synopsized in this attachment. Supporting information as to the reason(s) for the change(s) and a summary of the 10 CFR 50.59 evaluations are included, as applicable.

There were no major changes to the radioactive liquid, gaseous, and solid waste treatment systems for 2022.

ATTACHMENT 5

INOPERABILITY OF RADIOACTIVE LIQUID AND GASEOUS

EFFLUENT MONITORING INSTRUMENTATION

(01/22 - 12/22)

As required by the ODCM, Sections 6.2.2.b.2 and 6.3.2.b.3, a list and explanation for extended inoperability of radioactive liquid and/or gaseous effluent monitoring instrumentation is provided in this attachment.

No liquid and/or gaseous effluent monitoring instrumentation was out of service for > 30 days during the reporting period.

ATTACHMENT 6

UNPLANNED RELEASES

(01/22 - 12/22)

As required by the ODCM, Section 6.7.2.a.3, a list of unplanned releases, from the site to unrestricted areas, of radioactive material in gaseous and liquid effluents occurring during the reporting period, is made in this attachment.

There were no unplanned releases during calendar year 2022 meeting the criteria of Section 6.7.2.a.3 of the ODCM from the site to unrestricted areas. Also, there were no spills or leaks that required voluntary communication under the criteria of the NEI Ground Water Protection Initiative, NEI 07-07. The current groundwater monitoring network provides adequate assurance that radiological contamination of groundwater will be detected in a timely manner. (i.e., prior to migration offsite). Both the historic and current tritium levels do not pose a risk to human health and the environment. The current tritium levels are well below the drinking water standard of 20,000 pCi/L. Furthermore, the impacted groundwater is controlled and discharged via a monitored discharge.

ATTACHMENT 7
LOWER LIMITS OF DETECTION FOR EFFLUENT SAMPLE ANALYSIS
(01/22 - 12/22)

Gaseous Effluents:

Radioisotope	Required L.L.D. µCi/mL	Typical L.L.D. µCi/mL
Krypton - 87	1.00E-4	2.50E-8 - 7.50E-8
Krypton - 88	1.00E-4	4.00E-8 - 2.50E-7
Xenon - 133	1.00E-4	2.00E-8 - 1.00E-7
Xenon - 133m	1.00E-4	1.00E-7 - 4.00E-7
Xenon - 135	1.00E-4	1.00E-8 - 5.00E-8
Xenon - 135m	1.00E-4	5.00E-8 - 2.00E-7
Xenon - 138	1.00E-4	9.00E-8 - 4.00E-7
Iodine - 131	1.00E-12	3.00E-14 - 1.00E-13
Iodine - 133	1.00E-10	1.00E-14 - 7.00E-13
Manganese - 54	1.00E-11	2.00E-14 - 6.00E-14
Cobalt - 58	1.00E-11	2.00E-14 - 6.00E-14
Iron - 59	1.00E-11	6.00E-14 - 1.00E-13
Cobalt - 60	1.00E-11	3.00E-14 - 1.00E-13
Zinc - 65	1.00E-11	6.00E-14 - 2.00E-13
Strontium - 89	1.00E-11	3.00E-14 - 8.00E-12
Strontium - 90	1.00E-11	3.00E-15 - 9.00E-12
Molybdenum - 99	1.00E-11	2.00E-14 - 1.00E-13
Cesium - 134	1.00E-11	2.00E-14 - 8.00E-14
Cesium - 137	1.00E-11	3.00E-14 - 8.00E-14
Cerium - 141	1.00E-11	3.00E-14 - 1.00E-13
Cerium - 144	1.00E-11	1.50E-13 - 4.00E-13
Gross Alpha	1.00E-11	7.00E-15 - 2.00E-14
Tritium	1.00E-6	4.00E-09 - 9.00E-09

ATTACHMENT 7
LOWER LIMITS OF DETECTION FOR EFFLUENT SAMPLE ANALYSIS
(01/22 - 12/22)

Liquid Effluents:

Radioisotope	Required L.L.D. µCi/mL	Typical L.L.D. µCi/mL
Krypton - 87	1.00E-5	3.00E-8 - 1.00E-7
Krypton - 88	1.00E-5	5.00E-8 - 5.00E-7
Xenon - 133	1.00E-5	3.00E-8 - 1.00E-7
Xenon - 133m	1.00E-5	9.00E-8 - 3.00E-7
Xenon - 135	1.00E-5	1.00E-8 - 5.00E-8
Xenon - 135m	1.00E-5	3.00E-8 - 2.00E-7
Xenon - 138	1.00E-5	1.00E-7 - 1.00E-6
Iodine - 131	1.00E-6	1.00E-8 - 5.00E-8
Manganese - 54	5.00E-7	1.00E-8 - 5.00E-8
Iron - 55	1.00E-6	3.00E-7 - 8.00E-7
Cobalt - 58	5.00E-7	1.50E-8 - 6.00E-8
Iron - 59	5.00E-7	3.00E-8 - 7.00E-8
Cobalt - 60	5.00E-7	1.00E-8 - 5.50E-8
Zinc - 65	5.00E-7	3.00E-8 - 6.00E-8
Strontium - 89	5.00E-8	1.00E-8 - 4.00E-8
Strontium - 90	5.00E-8	5.00E-9 - 9.00E-9
Molybdenum - 99	5.00E-7	2.00E-8 - 6.00E-8
Cesium - 134	5.00E-7	1.50E-8 - 5.00E-8
Cesium - 137	5.00E-7	1.50E-8 - 6.00E-8
Cerium - 141	5.00E-7	3.00E-8 - 9.00E-8
Cerium - 144	5.00E-7	1.00E-7 - 5.00E-7
Gross Alpha	1.00E-7	2.00E-8 - 7.00E-8
Tritium	1.00E-5	2.00E-6 - 5.00E-6

ATTACHMENT 8

RESULTS OF GROUND WATER PROTECTION INITIATIVE SAMPLE ANALYSIS (01/22 - 12/22)

The Ground Water Protection Program was established to improve North Anna's management of and response to instances where the inadvertent release of radioactive substances may result in low but detectible levels of plant-related materials in subsurface soils and water. It complies with the requirements of NEI 07-07, INDUSTRY GROUND WATER PROTECTION INITIATIVE - FINAL GUIDANCE DOCUMENT. The industry initiative is intended to improve public trust and confidence in the nuclear industry through sampling and analysis of ground water and timely and effective communication with stakeholders, including the public and local, state, and federal officials.

Samples are obtained from monitoring wells installed both inside and outside the restricted area on a quarterly basis and analyzed onsite. Annually, during the second quarter, these samples are analyzed by an Independent Lab. Samples are also obtained from sumps and yard drains on a quarterly basis and analyzed onsite. Samples may be obtained more frequently than normal, if required and may be analyzed on-site or by an Independent Lab. The required Lower Limits of Detection, LLDs, and reporting limits for the ground water detection program are those associated with the radiological environmental program as listed in Attachments 11 and 12 to VPAP-2103N.

On the following pages is a summary of the samples and results of the ground water protection program taken for calendar year 2022. All liquid results are reported in pCi/L, while soil results for tritium are reported in pCi/g of soil, wet. An "N/A" indicates a sample analysis was not performed for that sample. A "< value " indicates an analysis was performed but the result was less than the Minimum Detectable Activity, MDA, and the required LLD. If a result is greater than the MDA, but less than the LLD the result is listed. Some of these results may be false positives, due to the analysis software or interferences from naturally occurring radioactivity. In these cases, instead of the value, an explanatory footnote is provided.

ATTACHMENT 8
RESULTS OF GROUND WATER PROTECTION INITIATIVE SAMPLE ANALYSIS
(01/22 - 12/22)

1st Quarter 2022

Sample	Date	Sample Media	H-3(1)	Gamma –Emitting Particulates(1)	I-131(1)	Sr-89/90(1)	Fe-55(1)	Ni-63(1)	Alpha TRU(1)	Pu-241(1)
GWP-18	01/26/22	WATER	3255	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-1	02/13/22	Insufficient volume								
PZ-2	02/13/22	Insufficient volume								
PZ-3	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-3	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-4	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-15R	03/02/22	WATER	<1144	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-17	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	02/23/22	WATER	4933	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-19	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-20	02/13/22	WATER	<1133	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-6	02/23/22	WATER	<1116	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	03/19/22	WATER	4620	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sub Surface Drains	02/23/22	WATER	<1385	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Intake Storm Drains	02/23/22	WATER	<1142	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Intake Storm Drains	02/23/22	WATER	<1142	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Disch Canal Storm Drains	03/02/22	WATER	<1382	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	02/23/22	WATER	1418	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	02/23/22	WATER	1582	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	02/23/22	WATER	3329	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	02/23/22	WATER	2971	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	02/23/22	WATER	2456	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	02/23/22	WATER	3197	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	03/19/22	WATER	<1227	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	03/19/22	WATER	<1227	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	03/19/22	WATER	<1227	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	03/19/22	WATER	1364	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	03/19/22	WATER	<1227	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	03/19/22	WATER	1960	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) pCi/L

ATTACHMENT 8
RESULTS OF GROUND WATER PROTECTION INITIATIVE SAMPLE ANALYSIS
(01/22 - 12/22)

2nd Quarter 2022

Sample	Date	Sample Media	H-3[1]	Gamma –Emitting Particulates[1]	I-131[1]	Sr-89/90[1]	Fe-55[1]	Ni-63[1]	Alpha TRU[1]	Pu-241[1]
GWP-18	04/04/22	WATER	3966	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-1	04/11/22	WATER	<1287	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-2	04/11/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-3	04/06/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-3	04/05/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-4	04/06/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-5A	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-6	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-7	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-8	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-9	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-13	04/11/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-16	04/15/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-19	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-20	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-21	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-22	04/08/22	WATER	<1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-23	04/11/22	Insufficient volume								
GWP-14	04/20/22	WATER	<1118	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-15R	04/15/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-17	04/20/22	WATER	<1118	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	05/12/22	WATER	3699	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sub Surface Drains	05/19/22	WATER	<1663	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Intake Storm Drains	06/02/22	WATER	<1633	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Intake Storm Drains	06/02/22	WATER	<1633	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Disch Canal Storm Drains	06/02/22	WATER	<1633	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	06/06/22	WATER	1990	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	06/06/22	WATER	1410	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	06/06/22	WATER	1869	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	06/06/22	WATER	2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	06/06/22	WATER	2005	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	06/06/22	WATER	2724	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	06/20/22	WATER	3616	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-1	04/12/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-2	04/14/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-4	04/14/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-2	04/13/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-3	04/12/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-5	04/14/22	WATER	<1126	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-1 (2)	04/12/22	WATER	<948	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-2 (2)	04/14/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BTW-4 (2)	04/14/22	WATER	<950	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-2 (2)	04/13/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TTW-3 (2)	04/12/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-5 (2)	04/14/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-3 (2)	04/06/22	WATER	1100	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-3 (2)	04/05/22	WATER	<950	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-4 (2)	04/06/22	WATER	<950	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-5A (2)	04/08/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-6 (2)	04/08/22	WATER	<951	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-7 (2)	04/08/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-8 (2)	04/08/22	WATER	<952	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-9 (2)	04/08/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-13 (2)	04/11/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-14 (2)	04/20/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-15R (2)	04/15/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-16 (2)	04/15/22	WATER	<950	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-17 (2)	04/20/22	WATER	1230	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18 (2)	04/04/22	WATER	4880	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-19 (2)	04/08/22	WATER	1920	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-20 (2)	04/08/22	WATER	<949	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-21 (2)	04/08/22	WATER	<950	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-22 (2)	04/08/22	WATER	1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-1	04/11/22	WATER	3300	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-2	04/11/22	WATER	1400	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TTW-1	Well abandoned in place, pending decommissioning									
TTW-4	Well abandoned in place, pending decommissioning									

(1) pCi/L (2) Vendor Analysis

ATTACHMENT 8
RESULTS OF GROUND WATER PROTECTION INITIATIVE SAMPLE ANALYSIS
(01/22 - 12/22)

3rd Quarter 2022

Sample	Date	Sample Media	H-3[1]	Gamma –Emitting Particulates[1]	I-131[1]	Sr-89/90[1]	Fe-55[1]	Ni-63[1]	Alpha TRU[1]	Pu-241[1]
GWP-18	07/21/22	WATER	3937	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-3	08/10/22	WATER	1164	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-3	08/10/22	WATER	<1086	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-4	08/10/22	WATER	1095	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-6	08/10/22	WATER	1285	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-17	08/12/22	WATER	<1086	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-15R	08/12/22	WATER	<1086	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	08/12/22	WATER	3657	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-19	08/10/22	WATER	1873	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-20	08/10/22	WATER	<1086	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	09/15/22	WATER	4042	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sub Surface Drains	08/24/22	WATER	<1495	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Intake Storm Drains	08/29/22	WATER	<1508	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Intake Storm Drains	08/29/22	WATER	<1508	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Disch Canal Storm Drains	08/29/22	WATER	<1508	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	09/07/22	WATER	1330	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	09/07/22	WATER	<1150	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	09/07/22	WATER	1318	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	09/07/22	WATER	2838	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	09/07/22	WATER	1277	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	09/07/22	WATER	2931	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) pCi/L

ATTACHMENT 8
RESULTS OF GROUND WATER PROTECTION INITIATIVE SAMPLE ANALYSIS
(01/22 - 12/22)

4th Quarter 2022

Sample	Date	Sample Media	H-3[1]	Gamma –Emitting Particulates[1]	I-131[1]	Sr-89/90[1]	Fe-55[1]	Ni-63[1]	Alpha TRU[1]	Pu-241[1]
GWP-18	10/06/22	WATER	3638	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PZ-3	10/10/22	WATER	921	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-3	10/10/22	WATER	1350	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-4	10/10/22	WATER	1548	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-6	10/10/22	WATER	1261	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-15R	10/09/22	WATER	1352	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-17	10/09/22	WATER	1097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-19	10/10/22	WATER	1329	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-20	10/10/22	WATER	<854	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	11/04/22	WATER	4762	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GWP-18	12/02/22	WATER	4979	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sub Surface Drains	11/21/22	WATER	<1270	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Intake Storm Drains	11/21/22	WATER	<1280	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Intake Storm Drains	11/21/22	WATER	<1380	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Disch Canal Storm Drains	11/21/22	WATER	<1230	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	10/05/22	WATER	1636	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	10/05/22	WATER	2726	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	10/05/22	WATER	2552	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	10/05/22	WATER	2397	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	10/05/22	WATER	1081	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	10/05/22	WATER	2900	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump East	11/09/22	WATER	<862	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 Mat Sump South	11/09/22	WATER	<893	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Inside	11/09/22	WATER	<888	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 Mat Sump Outside	11/09/22	WATER	<890	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-1 AB/FB GWMS	11/09/22	WATER	<846	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-2 AB/FB GWMS	11/09/22	WATER	<827	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) pCi/L

ATTACHMENT 9
CARBON-14 CALCULATIONS
(01/22 - 12/22)

Carbon-14, C-14, is a naturally occurring isotope of carbon produced by cosmic ray interactions in the atmosphere. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Due to the long half-life of C-14, 5730 years, a significant portion of the C-14 from this testing is still present in the environment. C-14 is also produced in commercial nuclear reactors, but the amounts produced are much less than those produced naturally or from weapons testing.

In Regulatory Guide 1.21, Revision 2, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste", the NRC has recommended that U.S. nuclear power plants evaluate whether C-14 is a "principal radionuclide", and if so, report the amount of C-14 released. At North Anna, improvements over the years in fuel performance have resulted in a decrease in the amount and distribution of radionuclides released to the environment in gaseous effluents. As a result, C-14 has become a "principal radionuclide" for the gaseous effluent pathway at North Anna, as defined in Regulatory Guide 1.21, Revision 2. Because the dose contribution of C-14 to liquid radioactive waste is a small fraction of the dose compared to other nuclides, evaluation of C-14 in liquid effluents is not required by Regulatory Guide 1.21, Revision 2.

The quantity of gaseous C-14 released to the environment can be estimated by use of a C-14 source term scaling factor based on power generation. North Anna utilized methodology in EPRI Report, Estimation of C-14 in Nuclear Power Gaseous Effluents. Based on this document, at full capacity, North Anna would generate and release about 31.8 Ci of C-14 per year. Since the units did not operate at full power for 100% of the year, this value was corrected for the capacity factor of each unit yielding an estimated 26.7 Ci of C-14 produced and released. North Anna assumed that the fractional release of gaseous C-14 in any quarter and pathway could be approximated by the fraction of noble gasses released via that pathway in that quarter.

Most C-14 species initially produced in a Pressurized Water Reactor are organic, e.g., methane. C-14 releases in PWRs occur primarily as a mix of organic carbon and carbon dioxide released from the waste gas system. C-14 in the primary coolant is essentially all organic with a large fraction as a gaseous species. Any time the RCS liquid or gas is exposed to an oxidizing environment, a slow transformation from an organic to an inorganic chemical form can occur. Various studies documenting measured C-14 releases from PWRs suggest a range of 70% to 95% organic. North Anna used a value of 70% organic and 30% CO_2 in its calculations.

Public dose estimates from airborne C-14 were performed using dose models in NUREG-0133 and Regulatory Guide 1.109. The estimated C-14 dose impact on the maximum organ dose from airborne effluents released at North Anna is estimated to be 8.224E-02 mrem from the inhalation pathway, or 5.483E-03% TS of the 1500 mrem/yr dose rate limit and 9.963E-01 mrem from the ingestion pathway or 3.32E+00% TS of the 10CFR50, Appendix I, ALARA design objective of 15 mrem/yr per unit. In both cases the critical organ was determined to be the child's bone.

Miscellaneous

There was one entry on the 2022 Annual Effluent Release Report Log. Item 22-01 was entered to document that annual Meteorological data recovery was less than 90 percent on an annual basis. See Reg Guide 1.23, Revision 1, Page 10, Section 5, paragraph 1.