

SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

NORTH ANNA POWER STATION

JANUARY 01, 1986 TO JUNE 30, 1986

PREPARED BY: William C. Barnes, III
William C. Barnes, III
Assistant Supervisor
Health Physics
(Count Room & Environmental)

REVIEWED BY: O. E. Hickman, Jr.
O. E. Hickman, Jr.
Supervisor Health Physics
(Technical Services)

REVIEWED BY: A. H. Stafford
A. H. Stafford
Superintendent Health Physics

APPROVED BY: E. Wayne Harrel
E. Wayne Harrel
Station Manager

8801270616 860828
PDR ADOCK 0500033B
R PDR

FORWARD

This report is submitted as required by Appendix A to Operating License Nos. NPF-4 and NPF-7, Technical Specifications for North Anna Power Station, Units 1 and 2, Virginia Electric and Power Company, Docket Nos. 50-338, 50-339, Section 6.9.1.9.

SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
FOR THE

NORTH ANNA POWER STATION

JANUARY 01, 1986 TO JUNE 30, 1986

<u>SECTION NO.</u>	<u>INDEX</u> <u>SUBJECT</u>	<u>PAGE</u>
1	PURPOSE AND SCOPE	1
2	DISCUSSION	1
3	SUPPLEMENTAL INFORMATION	3
Attachment 1	Effluent Release Data	4
Attachment 2	Annual and Quarterly Doses	5
Attachment 3	Revisions to Offsite Dose Calculation Manual (ODCM) . .	6
Attachment 4	Revisions to Process Control Program (PCP)	7
Attachment 5	Major changes to Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems	8
Attachment 6	Radioactive Liquid and Gaseous Effluent Monitoring Instrumentation Inoperable	9
Attachment 7	Unplanned Releases	10

1.0 PURPOSE AND SCOPE

The Semi-Annual Radioactive Effluent Release Report includes 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 of Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof. The report also includes a list of unplanned releases during the reporting period.

As required by Technical Specification 6.15, changes to the ODCM for the time period covered by this report are included. Information is provided to support the changes along with a package of those pages of the ODCM changed.

This report includes changes to the PCP with information and documentation necessary to support the rationale for the changes as required by Technical Specification 6.14.

Major changes to radioactive liquid, gaseous and solid waste treatment systems are reported as required by Technical Specification 6.16. Information to support the reason(s) for the change(s) and a summary of the 10 CFR Part 50.59 evaluation are included. In lieu of reporting major changes in this report, major changes to the radioactive solid waste treatment system may be submitted as part of the annual FSAR update.

As required by Technical Specification 3.3.3.10.b and 3.3.3.11.b a list and explanation for the inoperability of radioactive liquid and/or gaseous effluent monitors is provided in this report.

2.0 DISCUSSION

The basis for the calculation of the percent of technical specification for the critical organ in Table 1A is Technical Specification 3.11.2.1.b.

Technical Specification 3.11.2.1.b requires that the dose rate for iodine-131, for tritium, and for all radionuclides in particulate form with half lives greater than 8 days shall be less than or equal to 1500 mrem/yr to the critical organ at and beyond the site boundary. The critical organ is the child's thyroid; inhalation pathway.

The basis for the calculation of percent of technical specification for the total body and skin in Table 1A is Technical Specification 3.11.2.1.a. Technical Specification 3.11.2.1.a requires that the dose rate for noble gases to areas at or beyond 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 basis for the calculation of the percent of technical specification in Table 2A is Technical Specification 3.11.1.1. Technical Specification 3.11.1.1 states that the concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microcuries/ml.

Percent of technical specification calculations are based on the total gaseous or liquid effluents released for that respective quarter.

Unplanned releases presented in Attachment 7 are defined according to the criteria presented in 10 CFR Part 50.73. Gaseous unplanned releases are those radioactive releases that exceed 2 times the applicable concentrations of the limits specified in Appendix B, Table II, of 10 CFR Part 20 in unrestricted areas, when averaged over a time period of one hour. Liquid unplanned releases are those effluent releases that exceed 2 times the

limiting combined Maximum Permissible Concentration (MPC) specified in Appendix B, Table II, of 10 CFR Part 20 in unrestricted areas for all radionuclides except tritium and dissolved noble gases, when averaged over a time period of one hour.

3.0 SUPPLEMENTAL INFORMATION

There are no inclusions for the time period covered by this report.

ATTACHMENT 1
EFFLUENT RELEASE DATA
1/86 - 6/86

This attachment includes a summary of the quantities of radioactive liquid and gaseous effluents and solid waste, as outlined in Regulatory Guide 1.21.

TABLE 1A
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
 NORTH ANNA POWER STATION

	UNITS	1st QUARTER	2nd QUARTER	EST. TOTAL % ERROR
<u>A. Fission and Activation Gases:</u>				
1. Total Release	Ci	4.01E+3	5.43E+2	1.5E+1
2. Average Release Rate for Period	μCi/sec	5.16E+2	6.91E+1	
<u>B. Iodines:</u>				
1. Total Iodine-131 Release	Ci	1.71E-3	8.51E-4	1.5E+1
2. Average Release Rate for Period:	μCi/sec	2.20E-4	1.08E-4	
<u>C. PARTICULATES (T_{1/2} < 8 days):</u>				
1. Total Particulate (T _{1/2} < 8 days) Release	Ci	1.04E-3	1.09E-4	1.5E+1
2. Average Release Rate for Period	μCi/sec	1.34E-4	1.39E-5	
3. Gross Alpha Radioactivity Release	Ci	7.26E-6	1.52E-5	
<u>D. Tritium:</u>				
1. Total Release	Ci	7.47E0	1.35E+1	1.5E+1
2. Average Release Rate for Period	μCi/sec	9.61E-1	1.72E0	
<u>E. Percentage of Technical Specification Limits:</u>				
1. Total Body Dose Rate	%	3.20E-1	3.33E-2	
2. Skin Dose Rate	%	1.24E-1	1.30E-2	
3. Critical Organ Dose Rate	%	2.84E-3	2.23E-3	

TABLE 1B
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 GASEOUS EFFLUENTS MIXED MODE RELEASES
 NORTH ANNA POWER STATION

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER
Fission and Activation Gases:					
Krypton - 85	CI	*	*	8.50E-2	1.71E+0
Krypton - 85m	CI	*	*	7.09E-2	2.88E-2
Krypton - 87	CI	*	*	*	*
Krypton - 88	CI	*	*	5.74E-2	2.66E-2
Xenon - 131m	CI	*	*	1.39E+0	1.50E+0
Xenon - 133	CI	1.42E+2	2.66E+1	2.74E+2	1.10E+2
Xenon - 133m	CI	7.13E-1	*	4.35E+0	7.99E-1
Xenon - 135	CI	2.74E+0	8.53E-1	3.81E+0	1.31E+0
Xenon - 135m	CI	*	*	*	*
Xenon - 138	CI	*	*	*	*
Other (Specify)					
Argon - 41	CI	*	*	2.23E-2	1.97E-2
Total for Period	CI	1.45E+2	2.75E+1	2.84E+2	1.15E+2
Iodines:					
Iodine - 131	CI	1.51E-5	1.75E-5	7.96E-6	2.03E-6
Iodine - 132	CI	*	*	9.33E-5	1.25E-7
Iodine - 133	CI	2.53E-5	2.84E-5	1.55E-6	1.86E-6
Iodine - 134	CI	*	*	*	*
Iodine - 135	CI	*	*	5.62E-7	8.81E-7
Total for Period	CI	4.04E-5	4.59E-5	1.03E-4	4.90E-6
Particulates:					
Strontium - 89	CI	*	*	*	*
Strontium - 90	CI	*	*	*	*
Cesium - 134	CI	*	*	*	*
Cesium - 137	CI	4.05E-7	9.58E-8	*	*
Barium - 140	CI	*	*	*	*
Lanthanum - 140	CI	*	*	*	*
Other (Specify)					
Cobalt - 58	CI	*	*	8.65E-7	4.82E-7
Cobalt - 60	CI	8.74E-7	7.15E-7	1.81E-7	3.83E-8

* Less than lower limits of detection

TABLE 1B
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 GASEOUS EFFLUENTS MIXED MODE RELEASES
 NORTH ANNA POWER STATION

Page 2 of 2

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER
Particulates (cont):					
Zirconium - 95	CI	*	*	1.26E-8	*
Niobium - 95	CI	*	*	2.00E-8	*
Iron - 55	CI	8.44E-8	*	*	*
Phosphorus - 32	CI	*	*	*	*
Total for Period ($T_{1/2} > 8$ days)	CI	1.36E-6	9.61E-7	1.08E-6	5.20E-7
Tellurium - 131m ($T_{1/2} < 8$ days)	CI	6.40E-7	*	*	*
Rubidium - 88 ($T_{1/2} < 8$ days)	CI	*	*	7.76E-5	1.99E-5
Total for Period ($T_{1/2} < 8$ days)	CI	6.40E-7	*	7.76E-5	1.99E-5
GROSS ALPHA:	CI	4.04E-10	5.65E-9	*	*
TRITIUM:	CI	7.72E-2	5.41E-1	1.40E-2	1.09E-3

* Less than lower limits of detection

TABLE 1C
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 GASEOUS EFFLUENTS GROUND - LEVEL RELEASES
 NORTH ANNA POWER STATION

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER
Fission and Activation Gases:					
Krypton - 85	CI	*	*	*	*
Krypton - 85m	CI	4.63E-2	1.71E-3	1.18E-2	*
Krypton - 87	CI	7.85E-2	*	*	*
Krypton - 88	CI	1.26E-1	*	1.81E-2	*
Xenon - 131m	CI	*	*	*	*
Xenon - 133	CI	3.38E+3	3.88E+2	2.90E+1	*
Xenon - 133m	CI	*	*	*	*
Xenon - 135	CI	1.66E+2	1.15E+1	2.70E+0	*
Xenon - 135m	CI	6.75E-1	9.09E-3	5.17E-1	*
Xenon - 138	CI	4.28E-1	*	*	*
Other (Specify)					
Argon - 41	CI	1.24E-1	3.34E-3	3.96E-1	*
Total for Period					
	CI	3.55E+3	4.00E+2	3.26E+1	*
Iodines:					
Iodine - 131	CI	1.44E-3	8.32E-4	2.48E-4	*
Iodine - 132	CI	*	*	2.97E-6	*
Iodine - 133	CI	5.10E-3	5.21E-3	6.37E-5	*
Iodine - 134	CI	*	*	2.49E-6	*
Iodine - 135	CI	*	*	3.77E-6	*
Total for Period					
	CI	6.54E-3	6.04E-3	3.21E-4	*
Particulates:					
Strontium - 89	CI	*	*	*	*
Strontium - 90	CI	*	*	*	*
Cesium - 134	CI	7.28E-6	1.50E-6	9.04E-6	*
Cesium - 137	CI	6.23E-5	6.79E-6	2.75E-5	*
Barium - 140	CI	*	*	*	*
Lanthanum - 140	CI	*	*	*	*
Other (Specify)					
Chromium - 51	CI	5.27E-5	*	*	*
Manganese - 54	CI	6.34E-6	*	1.02E-6	*

* Less than lower limits of detection

TABLE IC
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 GASEOUS EFFLUENTS GROUND - LEVEL RELEASES
 NORTH ANNA POWER STATION

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE			BATCH MODE	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER	
Particulates (cont):						
Cobalt - 58	CI	5.63E-4	1.59E-5	2.25E-6	*	*
Cobalt - 60	CI	2.01E-4	2.78E-6	9.88E-7	*	*
Niobium - 95	CI	9.62E-6	*	*	*	*
Ruthenium - 103	CI	1.15E-5	*	*	*	*
Phosphorus - 32	CI	5.08E-6	*	*	*	*
Iron - 55	CI	8.40E-5	*	*	*	*
Thulium - 170	CI	*	8.05E-5	*	*	*
Total For Period ($T_{1/2} > 8$ days)	CI	1.00E-3	1.07E-4	4.08E-5	*	*
Tellurium - 131m ($T_{1/2} < 8$ days)	CI	9.99E-4	*	*	*	*
Tellurium - 132 ($T_{1/2} < 8$ days)	CI	2.03E-6	*	*	*	*
Sodium - 24 ($T_{1/2} < 8$ days)	CI	*	*	6.52E-2	1.07E-4	*
Rubidium - 88 ($T_{1/2} < 8$ days)	CI	*	1.17E-5	1.57E-2	*	*
Rubidium - 89 ($T_{1/2} < 8$ days)	CI	*	6.08E-6	*	*	*
Cesium - 138 ($T_{1/2} < 8$ days)	CI	4.03E-4	1.60E-5	5.06E-3	*	*
Antimony - 122 ($T_{1/2} < 8$ days)	CI	*	*	7.99E-7	*	*
Total for Period ($T_{1/2} < 8$ days)	CI	1.40E-3	3.38E-5	8.60E-2	1.07E-4	*
GROSS ALPHA:	CI	7.26E-6	1.52E-5	*	*	*
TRITIUM:	CI	1.76E+0	1.30E+1	5.62E+0	3.48E-4	*

* Less than lower limits of detection

TABLE 2A
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 LIQUID EFFLUENTS--SUMMATION OF ALL RELEASES
 NORTH ANNA POWER STATION

	UNIT	1st QUARTER	2nd QUARTER	EST. TOTAL % ERROR
<u>A. Fission & Activation Products</u>				
1. Total release (not including tritium, gases, alpha)	Ci	2.93E-1	1.52E-1	1.5E+1
2. Average diluted concentration during period	µCi/ml	5.96E-10	2.07E-10	
3. Percent of applicable limit (T.S.)	%	1.91E-2	1.18E-2	
<u>B. Tritium</u>				
1. Total release activity.	Ci	2.91E+2	3.94E+2	1.5E+1
2. Average diluted concentration during period.	µCi/ml	5.91E-7	5.38E-7	
3. Percent of applicable limit (T.S.)	%	1.97E-2	1.79E-2	
<u>C. Dissolved and entrained gases</u>				
1. Total release activity.	Ci	6.60E-1	3.62E-1	1.5E+1
2. Average diluted concentration during period.	µCi/ml	1.34E-9	4.94E-10	
3. Percent of applicable limit (T.S.)	%	6.71E-4	2.47E-4	
<u>D. Gross Alpha Radioactivity</u>				
1. Total release activity.	Ci	*	*	1.5E+1
<u>E. Volume of waste released (prior to dilution)</u>				
	Liters	6.52E+7	6.50E+7	
<u>F. Volume of dilution water used during period</u>				
	Liters	4.92E+11	7.33E+11	

* Less than lower limits of detection

TABLE 2B
 EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT (1986)
 LIQUID EFFLUENTS
 NORTH ANNA POWER STATION

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER
Fission and Activation Products:					
Strontium - 89	CI	*	*	*	*
Strontium - 90	CI	*	*	*	*
Cesium - 134	CI	9.02E-3	3.68E-3	1.42E-6	*
Cesium - 137	CI	2.17E-2	1.37E-2	3.54E-6	*
Iodine - 131	CI	2.76E-3	2.39E-3	2.60E-7	*
Cobalt - 58	CI	1.14E-1	4.14E-2	1.48E-7	*
Cobalt - 60	CI	3.95E-2	1.06E-2	*	*
Iron - 59	CI	6.49E-3	1.66E-3	*	*
Zinc - 65	CI	*	*	*	*
Chromium - 51	CI	1.50E-2	4.58E-4	*	*
Manganese - 54	CI	1.5E-3	*	*	*
Niobium - 95	CI	4.02E-3	*	*	*
Zirconium - 95	CI	9.99E-4	*	*	*
Molybdenum - 99	CI	*	*	*	*
Technetium - 99m	CI	*	*	*	*
Barium - 140	CI	*	*	4.22E-8	*
Lanthanum - 140	CI	*	*	1.16E-8	*
Cerium - 141	CI	*	*	*	*
Other (Specify)					
Sodium - 24 ($T_{1/2} < 8$ days)	CI	4.08E-3	7.34E-2	6.49E-7	*
Cobalt - 57	CI	*	*	*	*
Silver - 110m	CI	1.78E-2	9.97E-4	*	*
Antimony - 122 ($T_{1/2} < 8$ days)	CI	5.50E-5	*	8.25E-8	*
Iodine - 132	CI	*	*	1.07E-6	*
Iodine - 133	CI	2.66E-3	3.18E-3	1.79E-6	*
Iodine - 134	CI	*	*	8.87E-7	*
Iodine - 135	CI	*	*	2.67E-6	*
Tellurium - 131m ($T_{1/2} < 8$ days)	CI	*	*	*	*
Cesium - 138 ($T_{1/2} < 8$ days)	CI	*	*	*	*
Iron - 55	CI	4.90E-2	*	*	*
Antimony - 124	CI	2.96E-3	8.25E-4	*	*
Ruthenium - 103	CI	1.17E-3	*	*	*
Phosphorus - 32	CI	*	*	*	*
Total for Period	CI	2.93E-1	1.52E-1	1.26E-5	*

* Less than lower limits of detection

TABLE 3 (1/86 - 6/86)
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

1. Type of Waste	UNIT	6-MONTH PERIOD	EST. TOTAL ERROR, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m ³	1.06E+2	1.0 E+1
	Ci	1.41E+2	1.0 E+1
b. Dry compressible waste, contaminated equipment, etc.	m ³	2.01E+2	1.0 E+1
	Ci	2.37E+2	1.0 E+1
c. Irradiated components, control rods, etc.	m ³	. E	. E
	Ci	. E	. E
d. Other (describe) Absorbed Oil	m ³	1.42E+1	1.0 E+1
	Ci	1.30E-3	1.0 E+1

2. Estimate of major nuclide composition (by type of waste)

a. Ni 63	21.00%	1.0 E+1
Co 58	20.50%	1.0 E+1
H 3	15.02%	1.0 E+1
Cs 137	10.70%	1.0 E+1
Fe 55	9.97%	1.0 E+1
Co 60	9.61%	1.0 E+1
Cs 134	4.83%	1.0 E+1
C 14	3.99%	1.0 E+1
Cm 244	2.68%	1.0 E+1
Pu 241	1.20%	1.0 E+1
Mn 54	0.72%	1.0 E+1
	. %	E
	. %	E
b. Fe 55	62.37%	1.0 E+1
Ni 63	11.02%	1.0 E+1
Co 60	8.41%	1.0 E+1
H 3	6.95%	1.0 E+1
Cs 137	3.79%	1.0 E+1
Cs 134	1.54%	1.0 E+1
Tc 99	1.36%	1.0 E+1
Sr 90	1.36%	1.0 E+1
C 14	0.98%	1.0 E+1
I 129	0.97%	1.0 E+1
Co 58	0.76%	1.0 E+1
Mn 54	0.44%	1.0 E+1
	. %	E
c. None	. %	E
	. %	E
	. %	E
	. %	E

2. Estimate of major nuclide composition (by type of waste)

d. Fe 55	70.75 %	1.0 E+1
Ni 63	18.13 %	1.0 E+1
Co 60	8.03 %	1.0 E+1
C 14	1.10 %	1.0 E+1
Cs 137	1.09 %	1.0 E+1
Tc 99	0.32 %	1.0 E+1
Sr 90	0.32 %	1.0 E+1
Cs 134	0.30 %	1.0 E+1
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E
	q/b	. E

3. Solid Waste Disposition

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
22	Private Vehicle	Barnwell, SC
1	Private Vehicle	Richland, WA

B. IRRADIATED FUEL SHIPMENTS (Disposition)

<u>NUMBER OF SHIPMENTS</u>	<u>MODE OF TRANSPORTATION</u>	<u>DESTINATION</u>
None		

ATTACHMENT 2
ANNUAL AND QUARTERLY DOSES
(1/86 - 6/86)

No attachment required for this semi-annual radioactive effluent release report, per Technical Specification 6.9.1.9.

ATTACHMENT 3

(1/86 - 6/86)

REVISIONS TO OFFSITE DOSE CALCULATION

MANUAL (ODCM)

As required by Technical Specification 6.15, revisions to the ODCM for the time period covered by this report are synopsised below. Supporting documentation and affected pages of the ODCM are attached.

- 2-28-86: Revisions were made to the ODCM to clarify projected gamma dose calculations, and to reference the correct Technical Specification requiring submittal of the Semiannual Report.
- 3-20-86: Revisions were made to the ODCM to reflect a new method of distributing revised sections.

NORTH ANNA POWER STATION
PROCEDURE ROUTING SLIP

INSTRUCTIONS: When you have completed the action for which this procedure was sent to you, date and initial, then forward the procedure to the next person or department. DO NOT REMOVE this routing slip.

UNIT 142 PROCEDURE NO. ODCM SAFETY NON-SAFETY

NEW PROCEDURE REVISION DELETION

REQUIRED APPROVAL DATE 3-20-86 REQUIRED DISTRIBUTION DATE 4-23-86 COMMITMENT DATE _____

(X through the routing order if no routing required.)

ORDER	TITLE	INITIALS	DATE	ORDER	TITLE	INITIALS	DATE
①	COGNIZANT SUPV.	DEH	3-18-86		SUPT.- TECH. SERV.		
	ASST STATION MANAGER O&M				SUPT.- PROJECTS		
	ASST STATION MANAGER NS&L			②	SUPT. - HEALTH PHYSICS	AHS	3-18-86
③	MANAGER, QUALITY ASSURANCE	ADG	3/18/86		SUPV. ADM. SERVICES		
	SUPT. - OPERATIONS				SUPV. - PLANNING		
	SUPT. - TRAINING						
	SUPT. - MAINTENANCE						

RETURN TO COGNIZANT DEPARTMENT

THIS PROCEDURE IS BEING FORWARDED TO/FOR: CHECK DATE REQ'D FROM PROOFING ACTION COMPLETED DATE INITIAL

_____	Cognizant Supervisor for Review/Approval or SNSOC Review/Approval	_____	_____
_____	Typing, First Time	_____	_____
_____	Attach Attachment 3 if entire procedure was typed	_____	_____
_____	Cognizant Dept: Proof Reading (I)	_____	_____
_____	Typing Corrections (I)	_____	_____
_____	Cognizant Dept: Proof Reading (II)	_____	_____
_____	Typing Corrections (II)	_____	_____
_____	Cognizant Dept: Proof Reading (III)	_____	_____
_____	Typing Corrections (III)	_____	_____
_____	Cognizant Dept: Proof Reading (IV)	_____	_____
_____	Drafting	_____	_____
_____	Cognizant Dept: Proof Reading-Drafting	_____	_____
_____	Station Records, for Processing and Distribution	_____	_____

SPECIAL NOTES/INSTRUCTIONS:

ORIGINATOR: D.E. Hickman, Jr.

REQUEST TO CHANGE PROCEDURE
 NORTH ANNA POWER STATION
 VIRGINIA POWER

ADM-5.4
 Attachment 3
 Page 1 of 1
 11-25-85

TO SUPERVISOR RESPONSIBLE FOR FOLLOWING PROCEDURE:

ABNORMAL	CURVE BOOK	OPERATING	WELDING
ADMINISTRATIVE	EMERGENCY	PERIODIC TEST	_____
ANNUNCIATOR	IN-SERVICE INSPECTION	<u>HEALTH PHYSICS</u>	_____
CALIBRATION	MAINTENANCE	SPECIAL TEST	_____
CHEMISTRY	NON-DESTRUCTIVE TEST	START-UP TEST	_____

PROCEDURE NO: ODCM 2 UNIT NO: 172 3 REVISION DATE: 12-19-85 4

TITLE: Offsite Dose Calculation Manual 5

CHANGES REQUESTED: (GIVE STEP NUMBER, EXACT SUGGESTED WORDING, AND LIST REFERENCES, STAPLE COPY OF PROCEDURE WITH SUGGESTED CHANGES MARKED TO THIS FORM.) 6

See attached

REFERENCES: None 7

REASON FOR CHANGES: To implement a new method of issuing revisions to the ODCM. * 8

CHANGE REQUESTED BY: D.E. Hickman Jr. 8 DATE: 3-18-86 9

ACTION TAKEN: * Tech Spec review 6.14/15.2.1.b : change does not reduce the accuracy or reliability of dose calculations or setpoint determinations. 10

DOES THIS CHANGE THE OPERATING METHODS AS DESCRIBED IN THE UFSAR? YES NO
 DOES THIS CHANGE INVOLVE A CHANGE TO THE TECH. SPECS? YES NO
 DOES THIS CHANGE INVOLVE A POSSIBLE UNREVIEWED SAFETY QUESTION? YES NO
 IF ALL "NO", NO "SAFETY ANALYSIS" IS REQUIRED. IF ANY "YES", A "SAFETY ANALYSIS" IS REQUIRED. (10CFR50.59) APPROVED COPY TO BE PROVIDED TO LICENSING COORD. FOR INCLUSION IN ANNUAL REPORT.

RECOMMENDED ACTION: APPROVED DISAPPROVED DOES THIS PROCEDURE CREATE A DOCUMENT? YES NO 11

BY: (COGNIZANT SUPERVISOR) D.E. Hickman Jr. 12 DATE: 3-18-86 13

REVIEWED FOR QUALITY ASSURANCE REQUIREMENTS: CHANGES MADE: YES NO 14

BY: [Signature] 15 DATE: 3/18/86 16

REVIEWED BY STATION NUCLEAR SAFETY AND OPERATING COMMITTEE: APPROVED DISAPPROVED APPROVED AS MODIFIED BY COMMITTEE 17

CHAIRMAN SIGNATURE: ER Lalo 18 DATE: 3-20-86 19

NEW PROCEDURE REVISION DATE: 20

ACTION COMPLETED BY: 21 DATE: 22

PROC. NO: ODCM CURRENT REV: Y DATE: 12-19-85 (1)

PROCEDURE TITLE: Offsite Dose Calculation Manual (2)

FOR NEW OR PERIODIC REVIEW: (Y/N) (3)

____ Procedure format correct (ref: ADM-5.10 through 5.27 for appropriate format)

____ Procedure references correct and current

HUMAN FACTOR ITEMS

- ____ ° No multiple actions per step
- ____ ° Precautions and Notes precede affected step
- ____ ° Precautions and Notes do not include actions steps
- ____ ° Sign off and QC Hold as required
- ____ ° Second or independent verification requirements as required

____ ALARA and personnel safety considered

____ Procedural step progression is technically sound

____ Commitments met by the procedure are identified as required by ADM-5.4

____ Reportability for off-normal results specified

____ Calculation or basis for numerical inputs required and available

____ Acceptance criteria specified and clear

____ Walkdown or checkout made

____ Valve position/lineup verified by operability test (if applicable)

____ Incorporation of previous vendor and engineering recommendations, if appropriate

____ Post maintenance testing requirements are included, if appropriate

____ Verification of no vital or protected area boundary degradation

____ Verification of no EQ as Appendix R design basis degradation

FOR CHANGES:

- Y Latest revision of existing procedure used
- Y Changes and location of their placement clear
- Y Deletions do not remove committed material/information
- N/A Additions clearly portray equipment, readings, data, etc.
- N/A Setpoint and/or acceptance criteria changed

	<u>STEP NO</u>	<u>REFERENCE</u>	(5)
° IF NO	_____	_____	
	_____	_____	
	_____	_____	

VIRGINIA POWER
NORTH ANNA POWER STATION

OFFSITE DOSE CALCULATION MANUAL
UNITS 1 AND 2

RECOMMENDED APPROVAL: ATB Stafford

APPROVED BY: ER J. Th On

CHAIRMAN STATION NUCLEAR SAFETY
AND OPERATING COMMITTEE

DATE: 12-19-85

~~8610280078~~
22 pp.

SAFETY RELATED

NORTH ANNA POWER STATION
OFFSITE DOSE CALCULATION MANUAL

REFERENCES:

1. North Anna Power Station Technical Specifications.
2. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I," Rev. 1, U.S. Nuclear Regulatory Commission, October 1977.
3. Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light - Water - Cooled Reactors," Rev. 1, U.S. Nuclear Regulatory Commission, July 1977.
4. U.S. Nuclear Regulatory Commission, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," NUREG-0133, October 1978.
5. U.S. Nuclear Regulatory Commission, "XOQDOQ, Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations," NUREG-0324, September 1977.
6. U.S. Nuclear Regulatory Commission, "User's Guide to GASPAR Code," NUREG-0597, June 1980.
7. North Anna Power Station Radioactive Release Reports for 1979, 1980, and 1981.
8. Virginia Electric and Power Company, North Anna Power Station, Units 1 and 2, Final Safety Analysis Report.
9. Virginia Electric and Power Company, Applicant's Environmental Report Supplement, North Anna Power Station, Units 1 and 2, March 15, 1972.

IMPLEMENTATION:

The provisions in the North Anna Offsite Dose Calculation Manual will be implemented upon approval of the North Anna Power Station Radiological Effluent Technical Specifications by the NRC.

NORTH ANNA POWER STATION

OFFSITE DOSE CALCULATION MANUAL

INDEX

<u>References/Implementation</u>	<u>Date</u>
<u>Section No.</u>	
1. Introduction	12-19-85
2. Liquid Effluent Radiation Monitor Setpoints	12-19-85
3. Liquid Effluent Concentration Limit	12-19-85
4. Liquid Effluent Dose Limits	12-19-85
5. Liquid Effluent Dose Projection	12-19-85
6. Gaseous Effluent Radiation Monitor Setpoints	12-19-85
7. Gaseous Effluent Release Rates	12-19-85
8. Noble Gas Effluent Air Dose Limits	12-19-85
9. Iodine - 131, Tritium, and Radionuclides in Particulate Form Gaseous Effluent Dose Limits	12-19-86
10. Gaseous Effluent Dose Projection	02-28-86
11. Total Dose	12-19-85
12. Semiannual Radioactive Effluent Release Report	02-28-86
13. Radiological Environmental Monitoring Locations	12-19-85
14. Interlaboratory Comparison Program	12-19-85
Appendix A:	
Section A1 - Meteorological Analysis	03-20-86
Section A2 - Liquid Pathway Analysis	03-20-86
Section A3 - Gaseous Pathway Analysis	03-20-86
Appendix B: Regulatory Guide 1.109; Revision 1, October 1977	03-20-86

NORTH ANNA POWER STATION

OFFSITE DOSE CALCULATION MANUAL

Appendix A

Section

- A1. Meteorological Analysis
- A2. Liquid Pathway Analysis
- A3. Gaseous Pathway Analysis

NORTH ANNA POWER STATION

OFFSITE DOSE CALCULATION MANUAL

APPENDIX B

U.S. Nuclear Regulatory Commission Regulatory Guide 1.109: CALCULATION
OF ANNUAL DOSES TO MAN FROM ROUTINE RELEASES OF REACTOR EFFLUENTS FOR
THE PURPOSE OF EVALUATING COMPLIANCE WITH 10 CFR PART 50, APPENDIX I

mk

NORTH ANNA POWER STATION
PROCEDURE ROUTING SLIP

ADM-5.4
Attachment 2
Page 1 of 1
11-25-85

INSTRUCTIONS: When you have completed the action for which this procedure was sent to you, date and initial, then forward the procedure to the next person or department. DO NOT REMOVE this routing slip.

UNIT 1 & 2 PROCEDURE NO. HP-ODcm-10 SAFETY NON-SAFETY

NEW PROCEDURE REVISION DELETION

REQUIRED APPROVAL DATE 2-28-86 REQUIRED DISTRIBUTION DATE 3-19-86 COMMITMENT DATE 2-28-86

(X through the routing order if no routing required.)

ORDER	TITLE	INITIALS	DATE	ORDER	TITLE	INITIALS	DATE
①	COGNIZANT SUPV.	<i>OEH</i>	<i>2-13-86</i>		SUPT. - TECH. SERV.		
	ASST STATION MANAGER O&M				SUPT. - PROJECTS		
	ASST STATION MANAGER NS&L			⑤	SUPT. - HEALTH PHYSICS	<i>AHS</i>	<i>2-15-86</i>
③	MANAGER, QUALITY ASSURANCE	<i>AJN</i>	<i>2/25/86</i>		SUPV. ADM. SERVICES		
	SUPT. - OPERATIONS				SUPV. - PLANNING		
	SUPT. - TRAINING						
	SUPT. - MAINTENANCE						

RETURN TO COGNIZANT DEPARTMENT

THIS PROCEDURE IS BEING
FORWARDED TO/FOR:
CHECK DATE

REQ'D FROM
PROOFING

ACTION COMPLETED
DATE INITIAL

_____	Cognizant Supervisor for Review/Approval or SURCO Review/Approval	_____	_____
_____	Typing, First Time	_____	_____
_____	Office Attachment 3 if entire procedure was retyped	_____	_____
_____	Cognizant Dept: Proof Reading (I)	_____	_____
_____	Typing Corrections (I)	_____	_____
_____	Cognizant Dept: Proof Reading (II)	_____	_____
_____	Typing Corrections (II)	_____	_____
_____	Cognizant Dept: Proof Reading (III)	_____	_____
_____	Typing Corrections (III)	_____	_____
_____	Cognizant Dept: Proof Reading (IV)	_____	_____
_____	Drafting	_____	_____
_____	Cognizant Dept: Proof Reading-Drafting	_____	_____
_____	Station Records, for Processing and Distribution	_____	_____

SPECIAL NOTES/INSTRUCTIONS:

ORIGINATOR: *Witt*

REQUEST TO CHANGE PROCEDURE
 NORTH ANNA POWER STATION
 VIRGINIA POWER

ADM-5.4
 Attachment 3
 Page 1 of 1
 11-25-85

TO SUPERVISOR RESPONSIBLE FOR FOLLOWING PROCEDURE:

ABNORMAL	CURVE BOOK	OPERATING	WELDING
ADMINISTRATIVE	EMERGENCY	<input checked="" type="checkbox"/> PERIODIC TEST	_____
ANNUNCIATOR	IN-SERVICE INSPECTION	HEALTH PHYSICS	_____
CALIBRATION	MAINTENANCE	SPECIAL TEST	_____
CHEMISTRY	NON-DESTRUCTIVE TEST	START-UP TEST	_____

PROCEDURE NO: HP-ODCM-10 2 UNIT NO: 192 3 REVISION DATE: 05-03-84 4

TITLE: NORTH ANNA POWER STATION OFFSITE DOSE CALCULATION MANUAL 5
Section 10: GASEOUS EFFLUENT Dose Projections

CHANGES REQUESTED: (GIVE STEP NUMBER, EXACT SUGGESTED WORDING, AND LIST REFERENCES, STAPLE COPY OF PROCEDURE WITH SUGGESTED CHANGES MARKED TO THIS FORM.) 6

See Attached Marked Copy

REFERENCES:

REASON FOR CHANGES:

Corrective Action's requirement for NAPSQA Audit No. N-85-72 finding No. 5.

CHANGE REQUESTED BY: William C. Barnes 8 DATE: 12-13-85 9

ACTION TAKEN: 10

DOES THIS CHANGE THE OPERATING METHODS AS DESCRIBED IN THE UPSAR? YES NO
 DOES THIS CHANGE INVOLVE A CHANGE TO THE TECH. SPECS? YES NO
 DOES THIS CHANGE INVOLVE A POSSIBLE UNREVIEWED SAFETY QUESTION? YES NO
 IF ALL "NO", NO "SAFETY ANALYSIS" IS REQUIRED. IF ANY "YES", A "SAFETY ANALYSIS" IS REQUIRED. (10CFR50.59) APPROVED COPY TO BE PROVIDED TO LICENSING COORD. FOR INCLUSION IN ANNUAL REPORT.

RECOMMENDED ACTION: APPROVED DISAPPROVED DOES THIS PROCEDURE CREATE A QA DOCUMENT? YES NO

BY: (COORDINATING SUPERVISOR) O.E. Hickman Jr. 12 DATE: 2-13-86 13

REVIEWED FOR QUALITY ASSURANCE REQUIREMENTS: CHANGES MADE: YES NO 14

BY: Ad-Hay 15 DATE: 2/25/86 16

REVIEWED BY STATION NUCLEAR SAFETY AND OPERATING COMMITTEE: APPROVED DISAPPROVED APPROVED AS MODIFIED BY COMMITTEE 17

CHAIRMAN SIGNATURE: Ed L. H. Or 18 DATE: 2-28-86 19

NEW PROCEDURE REVISION DATE: 20

ACTION COMPLETED BY: 21 DATE: 22

PROC. NO: HP-CDM-10 CURRENT REV: ✓ DATE: 05-03-84 (1)

PROCEDURE TITLE: NORTH ANNA POWER STATION OFFSITE NOSE CALCULATION MANUAL (2)
Section 10 GASEOUS EFFLUENT NOSE PROJECTIONS

FOR NEW OR PERIODIC REVIEW: (Y/N) (3)

____ Procedure format correct (ref: ADM-5.10 through 5.27 for appropriate format)

____ Procedure references correct and current

HUMAN FACTOR ITEMS

- ____ ° No multiple actions per step
- ____ ° Precautions and Notes precede affected step
- ____ ° Precautions and Notes do not include actions steps
- ____ ° Sign off and QC Hold as required
- ____ ° Second or independent verification requirements as required
- ____ ALARA and personnel safety considered
- ____ Procedural step progression is technically sound
- ____ Commitments met by the procedure are identified as required by ADM-5.4
- ____ Reportability for off-normal results specified
- ____ Calculation or basis for numerical inputs required and available
- ____ Acceptance criteria specified and clear
- ____ Walkdown or checkout made
- ____ Valve position/lineup verified by operability test (if applicable)
- ____ Incorporation of previous vendor and engineering recommendations, if appropriate
- ____ Post maintenance testing requirements are included, if appropriate
- ____ Verification of no vital or protected area boundary degradation
- ____ Verification of no EO an Appendix B design basis degradation

FORM CHANGES:

- Y Latest revision of existing procedure used
- Y Changes and location of their placement clear
- Y Deletions do not remove committed material/information
- Y Additions clearly portray equipment, readings, data, etc.
- N/A Setpoint and/or acceptance criteria changed

	<u>STEP NO</u>	<u>REFERENCE</u>	(5)
° IF NO	_____	_____	
	_____	_____	
	_____	_____	

Review Completed By: _____ Date: _____ Department: _____ (6)

W.H. O'Brien 12-13-85 Health Physics

NORTH ANNA POWER STATION
OFFSITE DOSE CALCULATION MANUAL

SECTION 10

GASEOUS EFFLUENT DOSE PROJECTIONS

<u>Part</u>	<u>Subject</u>	<u>Page</u>
1	Technical Specification Requirement	2
2	Projected Gamma Dose	2
3	Projected Beta Dose	2
4	Projected Maximum Exposed MEMBER OF THE PUBLIC Dose	2
5	Example	3

1. TECHNICAL SPECIFICATION REQUIREMENT

Technical Specification 3.11.2.4 requires that: "The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases, from each reactor unit, from the site to areas at or beyond the SITE BOUNDARY (see Figure 5.1-1) would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation over 31 days. The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases, from each reactor unit, from the site to areas at and beyond the SITE BOUNDARY (see Figure 5.1-1) would exceed 0.3 mrem to the critical organ over 31 days".

2. PROJECTED GAMMA DOSE

2.1 Determine D_g = the 31 day gamma air dose in the previous 31 day period calculated according to HP-ODCM-8.

2.2 Estimate R_g = ratio of the estimated volume of gaseous effluent in the present 31 day period to the volume released during the previous 31 day period.

2.3 Estimate F_g = ratio of the estimated noble gas effluent activity in the present 31 day period to the noble gas effluent activity during the previous 31 day period ($\mu\text{Ci/ml}$).

2.4 Determine PD_g = projected 31 day gamma air dose

$$PD_g = D_g (R_g F_g)$$

3. PROJECTED BETA DOSE

3.1 Determine D_b = the 31 day gamma air dose in the previous 31 day period, calculated according to HP-ODCM-8.

3.2 Estimate R_g and F_g as in steps 2.2 and 2.3 above.

3.3 Determine PD_b = projected 31 day period beta air dose

$$PD_b = D_b (R_g F_g)$$

4. PROJECTED MAXIMUM EXPOSED MEMBER OF THE PUBLIC DOSE

4.1 Determine D_{max} = the 31 day maximum exposed MEMBER OF THE PUBLIC dose in the previous 31 day period, calculated according to HP-ODCM-9.

4.2 Estimate F_1 = ratio of the estimated activity from I-131, radioactive materials in particulate form with half-lives greater than 8 days, and tritium in the present 31 day period to the activity of

I-131, radioactive materials in particulate form with half-lives greater than 8 days, and tritium in the previous 31 day period ($\mu\text{Ci/ml}$).

- 4.3 Determine PD_{\max} = projected 31 day maximum exposed MEMBER OF THE PUBLIC dose.

$$PD_{\max} = D_{\max} (R_g F_i)$$

NOTE:

Historical data pertaining to the volumes and radioactive concentrations of gaseous effluents released in connection to specific station functions, such as containment purges, shall be used in the above estimates as appropriate.

5. EXAMPLE

- 5.1 Compilation of data from release records for the process vent in a 31 day period provides the following information:

<u>Noble Gas Radionuclide</u>	<u>Concentration Released ($\mu\text{Ci/ml}$)</u>
Xe-133	5.58E-05
Xe-135	2.00E-07
Xe-131m	6.00E-08
Xe-133m	3.41E-08

- 5.2 Compilation of data from release records for the ventilation vents in a 31 day period provides the following information:

<u>Noble Gas Radionuclide</u>	<u>Concentration Released ($\mu\text{Ci/ml}$)</u>
Xe-133	1.23E-06
Xe-135	4.43E-09
Xe-131m	1.32E-09
Xe-133m	7.50E-10

- 5.3 The air dose for gamma radiation is calculated according to HP-ODCM-8 from:

$$D_g = 3.17E-08 \sum_i [M_{ivv} \bar{Q}_{ivv} + M_{ipv} \bar{Q}_{ipv}]$$

The appropriate values of M_{ivv} and M_{ipv} are obtained from Tables 7.0 and 7.1.

- 5.4 The average flow rate for a 31 day period for the process vent is 295 CFM, and for the ventilation vents 120,000 CFM. Determine the total activity in Curies released for a 31 day period:

Process Vent:

Noble Gas Radionuclide	Concentration Released ($\mu\text{Ci/ml}$)	x	1E-06 (Ci/ μCi)	x	3.63E+11 (ml)	=	Total Curies Released
Xe-133	5.58E-05	x	1E-06	x	3.63E+11	=	2.08E+01
Xe-135	2.00E-07	x	1E-06	x	3.63E+11	=	7.47E-02
Xe-131m	6.00E-08	x	1E-06	x	3.63E+11	=	2.24E-02
Xe-133m	3.41E-08	x	1E-06	x	3.63E+11	=	2.24E-02

Ventilation Vents:

Noble Gas Radionuclide	Concentration Released ($\mu\text{Ci/ml}$)	x	1E-06 (Ci/ μCi)	x	1.52E+14 (ml)	=	Total Curies Released
Xe-133	1.23E-06	x	1E-06	x	1.52E+14	=	1.87E+02
Xe-135	4.43E-09	x	1E-06	x	1.52E+14	=	6.73E-01
Xe-131m	1.32E-09	x	1E-06	x	1.52E+14	=	2.01E-01
Xe-133m	7.50E-10	x	1E-06	x	1.52E+14	=	1.14E-01

5.5 Calculating Dg:

Noble Gas Radionuclide	M_{ivv} (mrad/yr per Curie/sec)	x	\bar{Q}_{ivv} (Curie)	=	(mrad-sec)/yr
Xe-133	3.28E+03	x	1.87E+02	=	6.13E+05
Xe-135	1.79E+04	x	6.73E+01	=	1.20E+04
Xe-131m	1.45E+03	x	2.01E-01	=	2.91E+02
Xe-133m	3.04E+03	x	1.14E-01	=	3.47E+02

$$\sum_i M_{ivv} \bar{Q}_{ivv} = 6.26E+05$$

Noble Gas Radionuclide	M_{ipv} (mrad/yr per Curie/sec)	x	\bar{Q}_{ipv} (Curie)	=	(mrad-sec)/yr
Xe-133	4.24E+02	x	2.08E+01	=	8.82E+03
Xe-135	2.30E+03	x	7.47E-02	=	1.72E+02
Xe-131m	1.87E+02	x	2.24E-02	=	4.19E+00
Xe-133m	3.92E+02	x	1.27E-02	=	4.98E+00

$$\sum_i M_{ipv} \bar{Q}_{ipv} = 9.00E+03$$

$$Dg = 3.17E-08 \frac{\text{yr}}{\text{sec}} \left[6.26E+05 \frac{\text{mrad-sec}}{\text{yr}} + 9.00E+03 \frac{\text{mrad-sec}}{\text{yr}} \right]$$

$$Dg = 2.01E-02 \text{ mrad}$$

5.6 Total volume of gaseous effluent released in 31 day period is:

$$\left[\begin{array}{l} \text{31 day average flow} \\ \text{rate (CFM) for} \\ \text{process vent} \end{array} + \begin{array}{l} \text{31 day average flow rate} \\ \text{(CFM) for ventilation} \\ \text{vents A and B} \end{array} \right] \times 4.46E+04 \frac{\text{min}}{31 \text{ day}}$$

$$\text{Total Volume (ft}^3\text{)} = (295 \text{ CFM} + 120,000 \text{ CFM}) \times 4.46E+04$$

$$\text{Total Volume (ft}^3\text{)} = 5.37E+09$$

$$\text{Estimated total volume in 31 day period} = 4.46E+09 \text{ (ft}^3\text{)}$$

$$\text{Therefore, } R_g = \frac{4.46E+09}{5.37E+09} = 0.83$$

5.7 The average concentration released in 31 day period is:

$$\left[\begin{array}{l} \text{31 day process vent} \\ \text{average concentration} \\ \text{(\mu Ci/ml)} \end{array} + \begin{array}{l} \text{31 day ventilation vent} \\ \text{A and B average concentration} \\ \text{(\mu Ci/ml)} \end{array} \right]$$

$$\text{Average concentration released} = (5.61E-05 \frac{\mu\text{Ci}}{\text{ml}} + 1.24E-06 \frac{\mu\text{Ci}}{\text{ml}})$$

$$\text{Average concentration released} = 5.73E-05 \mu\text{Ci/ml.}$$

$$\text{Estimated concentration to be released} = 1.98E-06 \mu\text{Ci/ml.}$$

$$\text{Therefore, } F_g = \frac{1.98E-06}{5.73E-05} = 3.46E-02$$

5.8 The projected 31 day gamma air dose is:

$$PD_g = D_g (R_g F_g)$$

$$PD_g = 2.01E-02 \text{ mrad} \times 0.83 \times 3.46E-02$$

$$PD_g = 5.77E-04$$

NORTH ANNA POWER STATION
PROCEDURAL ROUTING SLIP

md ADM-5.4
Attachment 2
Page 1 of 1
11-25-85

INSTRUCTIONS: When you have completed the action for which this procedure was sent to you, date and initial, then forward the procedure to the next person or department. DO NOT REMOVE this routing slip.

UNIT 142 PROCEDURE NO. NP-ODCM-12 SAFETY NON-SAFETY

NEW PROCEDURE REVISION DELETION

REQUIRED APPROVAL DATE 2-28-86 REQUIRED DISTRIBUTION DATE 3-19-86 COMMITMENT DATE 2-28-86

(X through the routing order if no routing required.)

ORDER	TITLE	INITIALS	DATE	ORDER	TITLE	INITIALS	DATE
①	COGNIZANT SUPV.	<i>DEH</i>	<i>2-13-86</i>		SUPT.- TECH. SERV.		
	ASST STATION MANAGER O&M				SUPT.- PROJECTS		
	ASST STATION MANAGER NS&L			②	SUPT. - HEALTH PHYSICS	<i>AHS</i>	<i>2-15-86</i>
③	MANAGER, QUALITY ASSURANCE	<i>DLH</i>	<i>2/25/86</i>		SUPV. ADM. SERVICES		
	SUPT. - OPERATIONS				SUPV. - PLANNING		
	SUPT. - TRAINING						
	SUPT. - MAINTENANCE						

RETURN TO COGNIZANT DEPARTMENT

THIS PROCEDURE IS BEING
FORWARDED TO/FOR:
CHECK DATE

REQ'D FROM
PROOFING

ACTION COMPLETED
DATE INITIAL

_____	Cognizant Supervisor for Review/Approval or SRSOC Review/Approval	_____	_____
_____	Typing, First Time	_____	_____
_____	Affix Attachment 3 if entire procedure was returned	_____	_____
_____	Cognizant Dept: Proof Reading (I)	_____	_____
_____	Typing Corrections (I)	_____	_____
_____	Cognizant Dept: Proof Reading (II)	_____	_____
_____	Typing Corrections (II)	_____	_____
_____	Cognizant Dept: Proof Reading (III)	_____	_____
_____	Typing Corrections (III)	_____	_____
_____	Cognizant Dept: Proof Reading (IV)	_____	_____
_____	Drafting	_____	_____
_____	Cognizant Dept: Proof Reading-Drafting	_____	_____
_____	Station Records, for Processing and Distribution	_____	_____

SPECIAL NOTES/INSTRUCTIONS:

ORIGINATOR: *WHL/ER*

REQUEST TO CHANGE PROCEDURE
 NORTH ANNA POWER STATION
 VIRGINIA POWER

ADM-5.4
 Attachment 3
 Page 1 of 1
 11-25-85

TO SUPERVISOR RESPONSIBLE FOR FOLLOWING PROCEDURE: 1

ABNORMAL	CURVE BOOK	OPERATING	WELDING
ADMINISTRATIVE	EMERGENCY	PERIODIC TEST	_____
ANNUNCIATOR	IN-SERVICE INSPECTION	<input checked="" type="checkbox"/> HEALTH PHYSICS	_____
CALIBRATION	MAINTENANCE	SPECIAL TEST	_____
CHEMISTRY	NON-DESTRUCTIVE TEST	START-UP TEST	_____

PROCEDURE NO: HP-ODCM-12 2 UNIT NO: 1#2 3 REVISION DATE: 05-03-84 4

TITLE: NORTH ANNA POWER STATION OFF-SITE DOSE CALCULATION MANUAL 5
Section 12: SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT DOSE ASSESSMENT

CHANGES REQUESTED: (GIVE STEP NUMBER, EXACT SUGGESTED WORDING, AND LIST REFERENCES, STAPLE 6
 COPY OF PROCEDURE WITH SUGGESTED CHANGES MARKED TO THIS FORM.)

See Attached Marked Copy

REFERENCES:

REASON FOR CHANGES:

Corrective Action Requirement for NAPS QA Audit No. N-85-22
finding No. 04.

CHANGE REQUESTED BY: William C. Brown Jr 8 DATE: 12-13-85 9

ACTION TAKEN: 10

DOES THIS CHANGE THE OPERATING METHODS AS DESCRIBED IN THE UPSAR? YES NO
 DOES THIS CHANGE INVOLVE A CHANGE TO THE TECH. SPECS? YES NO
 DOES THIS CHANGE INVOLVE A POSSIBLE UNREVIEWED SAFETY QUESTION? YES NO
 IF ALL "NO", NO "SAFETY ANALYSIS" IS REQUIRED. IF ANY "YES", A "SAFETY ANALYSIS" IS REQUIRED.
 (10CFR50.59) APPROVED COPY TO BE PROVIDED TO LICENSING COORD. FOR INCLUSION IN ANNUAL REPORT.

RECOMMENDED ACTION:

APPROVED

DISAPPROVED

DOES THIS PROCEDURE CONTAIN A
 QA DOCUMENT? YES NO

BY: (COGNIZANT SUPERVISOR) O.E. Hickman Jr. 12 DATE: 2-13-86 13

REVIEWED FOR QUALITY ASSURANCE REQUIREMENTS:

CHANGES MADE: YES NO 14

BY: R. Hines 15 DATE: 2/25/86 16

REVIEWED BY STATION NUCLEAR SAFETY AND OPERATING COMMITTEE: 17
 APPROVED DISAPPROVED APPROVED AS MODIFIED BY COMMITTEE

CHAIRMAN SIGNATURE: E. L. Th... Jr 18 DATE: 2-28-86 19

NEW PROCEDURE REVISION DATE: 20

ACTION COMPLETED BY: 21 DATE: 22

PROCEDURE
REVIEW
CHECKLIST

ADM-5.4
Attachment 4
Page 1 of 1
11-25-85

PROC. NO: HP-ODM-12 CURRENT REV: ✓ DATE: 05-03-84 (1)

PROCEDURE TITLE: NORTH ANNA POWER STATION - OFFSITE DOSE CALCULATION MANUAL (2)
SECTION 12: SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

FOR NEW OR PERIODIC REVIEW: DOSE ASSESSMENT (3)
(Y/N)

____ Procedure format correct (ref: ADM-5.10 through 5.27 for appropriate format)

____ Procedure references correct and current

HUMAN FACTOR ITEMS

- ____ ° No multiple actions per step
- ____ ° Precautions and Notes precede affected step
- ____ ° Precautions and Notes do not include actions steps
- ____ ° Sign off and QC Hold as required
- ____ ° Second or independent verification requirements as required
- ____ ALARA and personnel safety considered
- ____ Procedural step progression is technically sound
- ____ Commitments not by the procedure are identified as required by ADM-5.4
- ____ Reportability for off-normal results specified
- ____ Calculation or basis for numerical inputs required and available
- ____ Acceptance criteria specified and clear
- ____ Walkdown or checkout made
- ____ Valve position/lineup verified by operability test (if applicable)
- ____ Incorporation of previous vendor and engineering recommendations, if appropriate
- ____ Post maintenance testing requirements are included, if appropriate
- ____ Verification of no vital or protected area boundary degradation
- ____ Verification of no EO as Appendix K design basis degradation

FOR CHANGES:

- Y Latest revision of existing procedure used
- Y Changes and location of their placement clear
- Y Deletions do not remove committed material/information
- Y Additions clearly portray equipment, readings, data, etc.
- N/A Setpoint and/or acceptance criteria changed

____ ° IF NO STEP NO _____ REFERENCE _____ (5)

Review Completed By: White C. Brown Date: 12-13-85 Department: Health Physics (6)

NORTH ANNA POWER STATION
OFFSITE DOSE CALCULATION MANUAL

SECTION 12

Semiannual Radioactive Effluent Release Report Dose Assessment

<u>Part</u>	<u>Subject</u>	<u>Page</u>
1	Technical Specification Requirement	2
2	Dose Assessment	2

1. TECHNICAL SPECIFICATION REQUIREMENT

Technical Specification 6.9.1.9 requires that the Semiannual Radioactive Release Report submitted within 60 days after January 1 of each year include, in part, an assessment of the radiation doses to individuals due to the radioactive liquid and gaseous effluents from the station during the previous calendar year, and assessment of the radiation doses to the maximum exposed MEMBER OF THE PUBLIC from reactor releases and radiation.

2. DOSE ASSESSMENT

1. The radiation doses to individuals due to the radioactive liquid and gaseous effluents from the station during the previous calendar year shall be calculated using the methodology presented in this Manual or in Regulatory Guide 1.109 (Revision 1), October 1977, "Calculation of Annual Dose to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I" (see Appendix B). Population doses are not to be included in the dose assessment.
2. The dose to the maximum exposed MEMBER OF THE PUBLIC due to the radioactive liquid and gaseous effluents from the station shall be incorporated with the dose assessment performed above. If the dose to the maximum exposed MEMBER OF THE PUBLIC exceeds twice the limits of Specification 3.11.1.2.a, 3.11.1.2.b, 3.11.2.2.a, 3.11.2.2.b, 3.11.2.3.a, or 3.11.2.3.b, the dose assessment shall include the contribution from direct radiation. U.S. Nuclear Regulatory Commission NUREG-0543, February 1980, "Methods for Demonstrating LWR Compliance With the EPA Uranium Fuel Cycle Standard (40CFR Part 190)", states "There is reasonable assurance that sites with up to four operating reactors that have releases within Appendix I design objective values are also in conformance with the EPA Uranium Fuel Cycle Standard, 40CFR Part 190".
3. The meteorological conditions during the previous calendar year or historical annual average atmospheric dispersion conditions shall be used for determining the gaseous pathway doses.

ATTACHMENT 4

(1/86 - 6/86)

REVISIONS TO PROCESS CONTROL PROGRAM (PCP)

As required by Technical Specification 6.14, revisions to the PCP for the time period covered by this report are synopsized below. Supporting documentation and affected pages of the PCP are attached.

No revisions to the PCP were required for the time period covered by this report.

ATTACHMENT 5

(1/86 - 6/86)

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

No major changes to the radioactive liquid, gaseous, and solid waste treatment systems were made for the time period covered by this report.

ATTACHMENT 6

(1/86 - 6/86)

RADIOACTIVE LIQUID AND GASEOUS

EFFLUENT MONITORING INSTRUMENTATION INOPERABLE

No radioactive effluent monitors were declared inoperable, as defined according to the criteria presented in Technical Specification 3.3.3.10.b and 3.3.3.11.b, for the time period covered by this report.

ATTACHMENT 7

(1/86 - 6/86)

UNPLANNED RELEASES

No unplanned releases, as defined according to the criteria presented in 10 CFR Part 50.73, occurred during the time period covered by this report.