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April 25, 2002

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413 and 50-414
2001 Annual Radioactive Effluent Release Report

Pursuant to Catawba Nuclear Station Technical Specification 5.6.3 and Selected Licensee Commitment 16.11-16.2, please find attached the Catawba Annual Radioactive Effluent Release Report for the period of January 1, 2001 through December 31, 2001. No revisions were made to the Process Control Program during this period.

Attachment I	Radioactive Effluent Releases
Attachment II	Supplemental Information
Attachment III	Solid Waste Disposal Report
Attachment IV	Meteorological Data
Attachment V	Unplanned Offsite Releases
Attachment VI	Assessment of Radiation Dose from Radioactive Effluents to Members of the Public (includes fuel cycle dose calculation results
Attachment VII	UFSAR Section 16.11 Radiological Effluent Controls
Enclosure	Offsite Dose Calculation Manual (CD-ROM)

Selected Licensee Commitment 16.11-7 associated with specific effluent monitoring instrumentation requires radioactive effluent releases to be suspended if monitoring instrumentation is inoperable and the cause to be explained in the next Radioactive Effluent Release Report.

The containment radiation monitors 2EMF 38, 39, and 40 are mounted as one unit in series and have a common sample path to and from containment. The monitors are on a common skid and have solenoid operated isolation valves on the sample and return lines. On July 7, 2001, sample flow was lost to the 2EMF 38, 39, 40 unit. The failure of this unit was attributed to blown fuses for solenoid valves 2MISV4231 and 2MISC4233. Repairs to these solenoids were delayed until the 2EOC11 refueling outage because of radiation levels and high temperatures locally at the valves. Manual containment air samples were obtained and analyzed by Radiation Protection until repairs were completed in September, 2001.

IE48

There are no commitments contained in this submittal.

Any questions concerning this report should be directed to Kay Nicholson at 803.831.3237.

Sincerely,

R. Michael Glover for

Gary R. Peterson

Attachments and Enclosure (1)

\2001 ARERR

xc: L. A. Reyes, Regional Administrator, Region II
C. P. Patel, NRR Senior Project Manager
*D. J. Roberts, Senior Resident Inspector

*without enclosure

ATTACHMENT I

Summary of Liquid and Gaseous Effluents Report

CATAWBA NUCLEAR STATION

EFFLUENT RELEASE DATA

(January 1, 2001 through December 31, 2001)

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

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
A. Fission and Activation Gases						
1. Total Release	Ci	1.99E-01	2.69E-01	3.19E-01	2.30E-01	1.02E+00
2. Avg. Release Rate	µCi/sec	2.56E-02	3.43E-02	4.01E-02	2.89E-02	3.23E-02
B. Iodine-131						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Avg. Release Rate	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates Half Life >= 8 days						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Avg. Release Rate	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium						
1. Total Release	Ci	5.77E+01	5.37E+01	3.89E+01	5.30E+01	2.03E+02
2. Avg. Release Rate	µCi/sec	7.43E+00	6.83E+00	4.89E+00	6.66E+00	6.45E+00

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS EFFLUENTS - ELEVATED RELEASES - CONTINUOUS MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Gases						
** No Nuclide Activities **		.....	.....	.....	.....	.....
2. Iodines						
** No Nuclide Activities **		.....	.....	.....	.....	.....
3. Particulates Half Life >= 8 days						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Tritium						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS EFFLUENTS - ELEVATED RELEASES - BATCH MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Gases						
** No Nuclide Activities **		.....	.....	.....	.....	.....
2. Iodines						
** No Nuclide Activities **		.....	.....	.....	.....	.....
3. Particulates Half Life >= 8 days						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Tritium						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS EFFLUENTS - GROUND RELEASES - CONTINUOUS MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Gases						
** No Nuclide Activities **		.....	.....	.....	.....	.....
2. Iodines						
** No Nuclide Activities **		.....	.....	.....	.....	.....
3. Particulates Half Life >= 8 days						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Tritium						
H-3	Ci	5.75E+01	5.35E+01	3.87E+01	5.28E+01	2.02E+02
Totals for Period...	Ci	5.75E+01	5.35E+01	3.87E+01	5.28E+01	2.02E+02

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS EFFLUENTS - GROUND RELEASES - BATCH MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Gases						
AR-41	Ci	1.86E-01	2.44E-01	2.13E-01	1.97E-01	8.41E-01
KR-85	Ci	0.00E+00	6.53E-03	2.44E-02	0.00E+00	3.09E-02
KR-85M	Ci	2.59E-05	0.00E+00	0.00E+00	0.00E+00	2.59E-05
XE-133	Ci	1.21E-02	1.84E-02	7.85E-02	3.16E-02	1.41E-01
XE-135	Ci	8.00E-04	2.20E-04	2.40E-03	1.32E-03	4.74E-03
Totals for Period...	Ci	1.99E-01	2.69E-01	3.18E-01	2.30E-01	1.02E+00
2. Iodines						
** No Nuclide Activities **		.....	.....	.....	.....	.....
3. Particulates Half Life >= 8 days						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Tritium						
H-3	Ci	2.28E-01	2.33E-01	2.18E-01	1.80E-01	8.59E-01
Totals for Period...	Ci	2.28E-01	2.33E-01	2.18E-01	1.80E-01	8.59E-01

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
A. Fission and Activation Products						
1. Total Release	Ci	1.81E-02	1.79E-02	2.65E-02	3.41E-02	9.66E-02
2. Average Diluted Concentration						
a. Continuous Releases	µCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
b. Batch Releases	µCi/ml	7.52E-10	7.82E-10	1.07E-09	1.36E-09	9.97E-10
B. Tritium						
1. Total Release	Ci	1.71E+02	1.96E+02	1.45E+02	2.21E+02	7.33E+02
2. Average Diluted Concentration						
a. Continuous Releases	µCi/ml	2.79E-07	5.27E-07	7.83E-07	1.30E-06	7.32E-07
b. Batch Releases	µCi/ml	7.05E-06	8.49E-06	5.81E-06	8.68E-06	7.50E-06
C. Dissolved and Entrained Gases						
1. Total Release	Ci	0.00E+00	0.00E+00	4.74E-04	3.93E-04	8.67E-04
2. Average Diluted Concentration						
a. Continuous Releases	µCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
b. Batch Releases	µCi/ml	0.00E+00	0.00E+00	1.92E-11	1.56E-11	8.96E-12
D. Gross Alpha Radioactivity						
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Diluted Concentration						
a. Continuous Releases	µCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
b. Batch Releases	µCi/ml	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E. Volume of Liquid Waste						
1. Continuous Releases	liters	1.40E+08	1.25E+08	1.11E+08	1.60E+08	5.35E+08
2. Batch Releases	liters	6.03E+05	5.79E+05	1.36E+06	1.79E+06	4.33E+06
F. Volume of Dilution Water						
1. Continuous Releases	liters	2.41E+09	2.29E+09	2.47E+09	2.51E+09	9.68E+09
2. Batch Releases	liters	2.41E+10	2.29E+10	2.47E+10	2.51E+10	9.68E+10

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID EFFLUENTS - CONTINUOUS MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Products						
** No Nuclide Activities **		.....	.....	.....	.....	.....
2. Tritium						
H-3	Ci	7.12E-01	1.27E+00	2.02E+00	3.47E+00	7.47E+00
Totals for Period...	Ci	7.12E-01	1.27E+00	2.02E+00	3.47E+00	7.47E+00
3. Dissolved and Entrained Gases						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID EFFLUENTS - BATCH MODE

Catawba Nuclear Station Units 1 & 2

REPORT FOR 2001	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Products						
AG-110M	Ci	1.91E-05	2.50E-05	2.01E-04	3.23E-05	2.77E-04
BA-140	Ci	0.00E+00	1.71E-06	0.00E+00	0.00E+00	1.71E-06
BE-7	Ci	4.89E-04	3.29E-04	0.00E+00	7.55E-04	1.57E-03
CO-57	Ci	9.83E-05	8.87E-05	1.07E-04	8.29E-05	3.77E-04
CO-58	Ci	6.87E-03	4.48E-03	3.59E-03	1.59E-02	3.09E-02
CO-60	Ci	7.91E-03	8.98E-03	1.83E-02	9.02E-03	4.43E-02
CR-51	Ci	5.40E-04	6.25E-04	5.95E-04	2.89E-03	4.65E-03
CS-134	Ci	2.01E-05	1.76E-05	0.00E+00	0.00E+00	3.77E-05
CS-137	Ci	3.65E-05	2.44E-05	1.68E-04	1.41E-04	3.69E-04
FE-59	Ci	5.53E-05	2.73E-05	1.27E-04	4.42E-04	6.52E-04
I-131	Ci	0.00E+00	0.00E+00	9.06E-07	0.00E+00	9.06E-07
I-133	Ci	0.00E+00	0.00E+00	7.97E-07	0.00E+00	7.97E-07
MN-54	Ci	1.16E-03	8.23E-04	2.00E-03	1.02E-03	5.00E-03
MN-56	Ci	0.00E+00	1.22E-05	0.00E+00	8.81E-07	1.30E-05
NA-24	Ci	0.00E+00	0.00E+00	0.00E+00	5.61E-06	5.61E-06
NB-95	Ci	5.83E-05	4.66E-05	3.23E-05	2.19E-04	3.56E-04
NB-97	Ci	9.51E-05	2.14E-05	2.13E-05	2.14E-05	1.59E-04
RU-103	Ci	0.00E+00	0.00E+00	1.45E-06	0.00E+00	1.45E-06
SB-124	Ci	0.00E+00	0.00E+00	0.00E+00	7.75E-04	7.75E-04
SB-125	Ci	7.59E-04	2.37E-03	1.13E-03	2.60E-03	6.86E-03
SN-113	Ci	0.00E+00	0.00E+00	0.00E+00	1.02E-06	1.02E-06
TC-99M	Ci	0.00E+00	0.00E+00	2.39E-05	0.00E+00	2.39E-05
W-187	Ci	0.00E+00	0.00E+00	9.34E-06	0.00E+00	9.34E-06
ZN-65	Ci	0.00E+00	0.00E+00	9.81E-05	0.00E+00	9.81E-05
ZR-95	Ci	1.59E-06	2.17E-05	1.45E-05	1.12E-04	1.49E-04
ZR-97	Ci	0.00E+00	0.00E+00	0.00E+00	4.50E-05	4.50E-05
Totals for Period...	Ci	1.81E-02	1.79E-02	2.64E-02	3.41E-02	9.66E-02
2. Tritium						
H-3	Ci	1.70E+02	1.95E+02	1.43E+02	2.18E+02	7.26E+02
Totals for Period...	Ci	1.70E+02	1.95E+02	1.43E+02	2.18E+02	7.26E+02
3. Dissolved and Entrained Gases						
KR-85	Ci	0.00E+00	0.00E+00	4.74E-04	3.93E-04	8.67E-04
Totals for Period...	Ci	0.00E+00	0.00E+00	4.74E-04	3.93E-04	8.67E-04
4. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

ATTACHMENT II

Supplemental Information

to the

Liquid and Gaseous Effluents Report

CATAWBA NUCLEAR STATION

2001 EFFLUENT AND WASTE DISPOSAL SUPPLEMENTAL INFORMATION

I. REGULATORY LIMITS - PER UNIT

A. NOBLE GASES - AIR DOSE

1. CALENDAR QUARTER - GAMMA DOSE = 5 MRAD
2. CALENDAR QUARTER - BETA DOSE = 10 MRAD
3. CALENDAR YEAR - GAMMA DOSE = 10 MRAD
4. CALENDAR YEAR - BETA DOSE = 20 MRAD

B. LIQUID EFFLUENTS - DOSE

1. CALENDAR QUARTER - TOTAL BODY DOSE = 1.5 MREM
2. CALENDAR QUARTER - ORGAN DOSE = 5 MREM
3. CALENDAR YEAR - TOTAL BODY DOSE = 3 MREM
4. CALENDAR YEAR - ORGAN DOSE = 10 MREM

C. IODINE - 131 AND 133, TRITIUM, PARTICULATES W/T 1/2 > 8 DAYS - ORGAN DOSE

1. CALENDAR QUARTER = 7.5 MREM
2. CALENDAR YEAR = 15 MREM

II. MAXIMUM PERMISSIBLE EFFLUENT CONCENTRATIONS

A. GASEOUS EFFLUENTS - INFORMATION FOUND IN OFFSITE DOSE CALCULATION MANUAL
B. LIQUID EFFLUENTS - INFORMATION FOUND IN 10CFR20, APPENDIX B, TABLE 2, COLUMN 2

III. AVERAGE ENERGY - NOT APPLICABLE

IV. MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

INFORMATION FOUND IN OFFSITE DOSE CALCULATION MANUAL

V. BATCH RELEASES

A. LIQUID EFFLUENT

1. 1.66E+02 = TOTAL NUMBER OF BATCH RELEASES
2. 8.76E+03 = TOTAL TIME (MIN.) FOR BATCH RELEASES.
3. 8.80E+01 = MAXIMUM TIME (MIN.) FOR A BATCH RELEASE.
4. 5.28E+01 = AVERAGE TIME (MIN.) FOR A BATCH RELEASE.
5. 3.30E+01 = MINIMUM TIME (MIN.) FOR A BATCH RELEASE.
6. 4.87E+04 = AVERAGE DILUTION WATER FLOW DURING RELEASES (GPM).

B. GASEOUS EFFLUENT

1. 9.10E+01 = TOTAL NUMBER OF BATCH RELEASES.
2. 9.98E+05 = TOTAL TIME (MIN.) FOR BATCH RELEASES.
3. 4.40E+04 = MAXIMUM TIME (MIN.) FOR A BATCH RELEASE.
4. 1.10E+04 = AVERAGE TIME (MIN.) FOR A BATCH RELEASE.
5. 3.10E+01 = MINIMUM TIME (MIN.) FOR A BATCH RELEASE.

VI. ABNORMAL RELEASES

A. LIQUID

1. NUMBER OF RELEASES = 0
2. TOTAL ACTIVITY RELEASED (CURIES) = 0

B. GASEOUS

1. NUMBER OF RELEASES = 0
2. TOTAL ACTIVITY RELEASED (CURIES) = 0

CATAWBA NUCLEAR STATION

The estimated percentage of error for both Liquid and Gaseous effluent release data at Catawba Nuclear Station has been determined to be ± 25.2%. This value was derived by taking the square root of the sum of the squares of the following discrete individual estimates of error:

(1) Flow rate determining devices = ± 20%

(2) Counting error = ± 15%

(3) Sample preparation error = ± 3%

ATTACHMENT III

Solid Waste Disposal Report

CATAWBA NUCLEAR STATION - SOLID RADIOACTIVE WASTE SHIPPED TO A DISPOSAL FACILITY

REPORT PERIOD 1/1/2001 THROUGH 12/31/2001

Type of Waste Shipped	Number of Shipments	Number of Containers	Waste Class	Container Type	Burial Volume (ft^3)	Burial Volume (m^3)	Total Activity (Curies)
1. Waste from Liquid Systems							
(A) Dewatered Secondary Resins	0	0	N/A	N/A	0	0	0
(B) Dewatered Primary Resins	3	3	3B	3HIC	360.9	10.22	241.2
(C) Evaporator Concentrates	0	0	N/A	N/A	0	0	0
(D) Dewatered Mechanical Filters	1	1	1C	1HIC	120.3	3.41	291.1
(E) Dewatered Demineralizers	0	0	N/A	N/A	0	0	0
(F) Solidified (Cement) Acids, Oils, Sludges	0	0	N/A	N/A	0	0	0
2. Dry Solid Waste							
(A) Dry Active Waste (compacted)	0	0	N/A	N/A	0	0	0
(B) Dry Active Waste (non-compacted)	1	1	1AS	1HIC	120.3	3.41	8.628
(C) Dry Active Waste (brokered)	---	---	---	---	800.0	22.65	1.879
(D) Irradiated Components	0	0	N/A	N/A	0	0	0
3. All Solid Waste	5[a]	5[a]	---	---	1401.5	39.69	542.807

[a]Does not include brokered Dry Active Waste totals

CATAWBA NUCLEAR STATION - SOLID RADIOACTIVE WASTE

SUMMARY OF PRINCIPAL RADIONUCLIDE COMPOSITION

REPORT PERIOD 1/1/2001 THROUGH 12/31/2001

Type of Waste	Radionuclide	% Abundance*
1. Waste from Liquid Systems		
(A) Dewatered Secondary Resins	(none shipped this period)	
(B) Dewatered Primary Resins	Cr-51	0.7
	Mn-54	4.8
	Co-57	0.2
	Co-58	1.8
	Fe-59	0.1
	Co-60	12.1
	Sn-113	0.1
	Sb-125	0.2
	Cs-134	0.2
	Cs-137	0.7
	C-14	0.2
	Fe-55	37.9
	Ni-59	0.3
	Ni-63	40.6
(C) Evaporator Concentrates	(none shipped this period)	
(D) Dewatered Mechanical Filters	Mn-54	1.3
	Co-57	0.1
	Co-58	0.1
	Co-60	15.4
	Zn-65	0.3
	Ag-110m	0.1
	Sb-125	0.6
	Fe-55	67.7
	Ni-63	14.6
(E) Dewatered Demineralizers	(none shipped this period)	
(F) Solidified Acids, Oils, Sludges	(none shipped this period)	

*Average percent abundance for all shipments during period (unlisted if <0.1%)

CATAWBA NUCLEAR STATION - SOLID RADIOACTIVE WASTE

SUMMARY OF PRINCIPAL RADIONUCLIDE COMPOSITION

REPORT PERIOD 1/1/2001 THROUGH 12/31/2001

Type of Waste	Radionuclide	% Abundance*
2. Dry Solid Waste		
(A) Dry Active Waste (compacted)	(none shipped this period)	
(B) Dry Active Waste (non-compacted)	H-3	1.5
	Cr-51	1.7
	Mn-54	1.9
	Co-57	0.1
	Co-58	12.4
	Co-60	13.9
	Nb-95	0.4
	Zr-95	0.3
	Ag-110m	0.2
	Sb-124	0.1
	Sb-125	0.5
	Cs-134	0.1
	Cs-137	0.1
	Ba/La-140	0.2
	Ce-144	0.1
	Fe-55	57.4
	Ni-63	9.1
(C) Dry Active Waste (brokered)	H-3	1.5
	Cr-51	1.3
	Mn-54	1.9
	Co-57	0.1
	Co-58	11.3
	Co-60	14.2
	Nb-95	0.3
	Zr-95	0.2
	Ag-110m	0.2
	Sb-124	0.1
	Sb-125	0.5
	Cs-134	0.1
	Cs-137	0.1
	Ba/La-140	0.1
	Ce-144	0.1
	Fe-55	58.4
	Ni-63	9.3
(D) Irradiated Components	(none shipped this period)	

*Average percent abundance for all shipments during period (unlisted if <0.1%)

CATAWBA NUCLEAR STATION - SOLID RADIOACTIVE WASTE

SUMMARY OF PRINCIPAL RADIONUCLIDE COMPOSITION

REPORT PERIOD 1/1/2001 THROUGH 12/31/2001

Type of Waste	Radionuclide	% Abundance*
3. All Solid Waste	Cr-51	0.4
	Mn-54	2.9
	Co-57	0.1
	Co-58	1.1
	Co-60	13.9
	Zn-65	0.1
	Sb-125	0.4
	Cs-134	0.1
	Cs-137	0.3
	C-14	0.1
	Fe-55	54.2
	Ni-59	0.1
	Ni-63	26.1

*Average percent abundance for all shipments during period (unlisted if <0.1%)

ATTACHMENT IV

Meteorological Data

CATAWBA NUCLEAR STATION

2001 METEOROLOGICAL JOINT FREQUENCY DISTRIBUTIONS

OF WIND SPEED, WIND DIRECTION, AND ATMOSPHERIC STABILITY

USING WINDS AT THE 10 M LEVEL

(Hours of Occurrence)

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 1
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY A

	WIND SPEED CLASS									
	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR										
-N-	.	.	1	1	6	16	10	2	.	36
-NNE-	.	.	.	.	7	26	16	7	.	56
-NE-	.	.	.	.	1	4	3	1	.	9
-E-	.	.	.	1	1	.	.	.	.	2
-SE-	.	.	1	2	3	.	.	.	.	6
-SSE-	.	.	1	11	6	.	.	.	.	18
-S-	1	.	1	9	8	1	.	.	.	20
-SSW-	1	.	1	13	40	26	6	1	.	88
-SW-	.	2	2	12	34	22	3	.	.	75
-WSW-	.	.	1	13	23	1	2	.	.	40
-W-	.	.	1	5	6	2	.	.	.	14
-WNW-	.	.	3	2	4	7	1	.	.	17
-NW-	.	.	.	.	2	5	3	4	4	18
-NNW-	.	.	1	.	2	6	17	12	.	38
TOTAL	2	2	13	69	143	116	61	27	4	437

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 2
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY B

	WIND SPEED CLASS							
	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR								
-N-	.	1	2	14	31	4	.	52
-NNE-	.	.	1	19	23	14	1	58
-NE-	.	1	.	2	3	8	1	15
-ENE-	.	1	3	.	.	1	.	5
-E-	.	.	.	1	.	.	.	1
-ESE-	.	2	3	1	.	.	.	6
-SE-	.	2	6	.	1	.	.	9
-SSE-	.	2	13	4	.	.	.	19
-S-	.	2	19	4	1	.	.	26
-SSW-	.	1	31	24	18	1	.	75
-SW-	1	4	20	19	7	2	.	53
-WSW-	.	1	14	8	3	.	.	26
-W-	.	.	11	6	.	.	.	17
-WNW-	.	.	3	7	3	4	2	19
-NW-	.	1	.	2	3	3	2	11
-NNW-	.	.	1	5	16	6	2	30
TOTAL	1	18	127	116	109	43	8	422

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 3
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY C

	WIND SPEED CLASS									
	0.45-0.74	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR										
-N-	.	.	.	1	3	56	25	4	.	89
-NNE-	.	.	.	.	7	29	34	5	.	75
-NE-	.	.	.	1	5	3	17	10	2	38
-ENE-	.	.	1	1	.	2	4	1	.	9
-E-	.	.	.	.	3	3	2	.	.	8
-ESE-	.	.	.	2	6	1	.	.	.	9
-SE-	.	.	2	3	11	3	1	.	.	20
-SSE-	.	.	.	7	29	10	.	.	.	46
-S-	.	.	1	9	25	3	1	.	.	39
-SSW-	.	.	.	5	34	32	10	3	1	85
-SW-	.	.	.	6	23	16	4	2	.	51
-WSW-	.	1	.	4	19	5	1	.	.	30
-W-	.	.	2	1	12	9	1	1	.	26
-WNW-	.	.	.	2	9	6	6	1	3	27
-NW-	.	.	.	1	.	8	4	.	3	16
-NNW-	.	.	.	1	2	14	2	2	2	23
-CALM-	1	.	.	.	.	.	.	.	.	1
TOTAL	1	1	6	44	188	200	112	29	11	592

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 4
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY D

	WIND SPEED CLASS											
	0.45-0.74	0.75-0.99	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR												
-N-	.	.	1	10	29	119	167	79	16	7	.	428
-NNE-	.	.	1	6	7	60	145	97	14	3	.	333
-NE-	.	1	1	3	3	22	57	62	22	17	1	189
-ENE-	.	.	2	.	8	14	20	16	7	3	2	72
-E-	.	.	2	.	3	17	4	.	1	.	.	27
-ESE-	.	1	1	3	18	11	.	2	.	.	.	36
-SE-	.	2	2	7	18	25	12	8	.	.	.	74
-SSE-	1	2	5	14	36	64	38	9	3	.	.	172
-S-	.	.	4	12	60	93	48	9	1	.	.	227
-SSW-	.	2	5	14	74	151	70	30	9	2	.	357
-SW-	.	1	3	25	67	81	43	16	1	1	.	238
-WSW-	.	1	4	11	48	35	11	4	1	1	.	116
-W-	.	6	4	18	31	25	8	2	.	.	.	94
-WNW-	.	2	2	11	27	36	19	10	5	.	.	112
-NW-	.	2	3	7	27	20	8	8	5	4	.	84
-NNW-	.	1	2	8	37	75	30	22	9	4	.	188
-CALM-	1	.	.	.	.	.	.	.	.	.	.	1
TOTAL	2	21	42	149	493	848	680	374	94	42	3	2748

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 5
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY E

	WIND SPEED CLASS											
	0.45-0.74	0.75-0.99	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR												
-N-	.	.	1	9	13	50	82	23	.	.	.	178
-NNE-	.	1	1	3	4	16	14	5	1	.	.	45
-NE-	.	.	1	1	1	4	8	11	7	9	.	42
-ENE-	.	1	.	.	3	3	7	5	6	1	1	27
-E-	.	1	1	2	4	9	6	4	1	.	.	28
-ESE-	.	.	.	3	8	4	6	2	.	.	.	23
-SE-	.	1	2	8	15	28	19	8	.	.	.	81
-SSE-	.	2	5	16	46	68	25	5	1	.	.	168
-S-	.	6	16	26	116	143	28	5	2	.	.	342
-SSW-	2	2	16	39	125	141	30	13	.	.	.	368
-SW-	.	6	23	43	90	53	13	3	.	.	.	231
-WSW-	.	3	28	40	42	9	3	1	.	.	.	126
-W-	.	4	16	23	22	20	1	.	.	.	.	86
-WNW-	.	7	6	24	34	35	9	3	.	.	.	118
-NW-	.	1	8	20	45	32	16	5	1	.	.	128
-NNW-	.	1	9	9	36	110	55	13	2	.	.	235
TOTAL	2	36	133	266	604	725	322	106	21	10	1	2226

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 6
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY F

	WIND SPEED CLASS									
	0.45-0.74	0.75-0.99	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR										
-N-	.	.	.	1	11	42	21	2	.	77
-NNE-	.	.	.	.	2	2	3	1	.	8
-NE-	.	.	.	.	.	.	1	1	2	4
-ENE-	.	.	1	.	.	.	.	.	.	1
-E-	.	.	.	.	.	1	.	.	.	1
-ESE-	.	.	.	.	.	2	1	.	.	3
-SE-	.	.	1	2	1	9	6	3	.	22
-SSE-	.	.	9	12	18	7	3	3	.	52
-S-	1	9	16	40	60	13	.	.	.	139
-SSW-	1	9	14	44	63	17	.	.	.	148
-SW-	.	5	24	32	24	1	.	.	.	86
-WSW-	.	6	12	23	25	3	.	.	.	69
-W-	1	4	10	14	21	14	.	.	.	64
-WNW-	.	7	11	20	32	29	3	.	.	102
-NW-	.	4	10	13	26	19	2	.	.	74
-NNW-	.	1	7	11	54	91	14	2	.	180
TOTAL	3	45	115	212	337	250	54	12	2	1030

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 7
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

PASQUILL STABILITY G

	WIND SPEED CLASS								
	0.45-0.74	0.75-0.99	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR									
-N-	.	.	1	1	11	33	8	.	54
-NNE-	.	.	.	.	.	.	.	1	1
-SE-	.	.	.	.	1	.	.	1	2
-SSE-	1	.	3	7	16	.	.	.	27
-S-	1	4	20	47	45	2	.	.	119
-SSW-	1	8	25	45	45	1	.	.	125
-SW-	3	23	22	25	16	3	.	.	92
-WSW-	7	17	19	9	9	3	.	.	64
-W-	8	16	17	9	19	8	.	.	77
-WNW-	10	23	14	16	9	2	.	.	74
-NW-	2	28	31	39	20	5	.	.	125
-NNW-	1	6	10	38	78	69	.	.	202
TOTAL	34	125	162	236	269	126	8	2	962

CATAWBA NUCLEAR STN. METEOROLOGY (2001) PROG=XOQFREQ 14:33 Monday, February 25, 2002 8
10M WIND SPEED/DIRECTION/DELTA-T STABILITY
STABILITY CLASSES BASED ON DELTA-T BETWEEN UPPER-LOWER LEVELS

ALL STABILITY CLASSES

	WIND SPEED CLASS											
	0.45-0.74	0.75-0.99	1.00-1.24	1.25-1.49	1.50-1.99	2.00-2.99	3.00-3.99	4.00-4.99	5.00-5.99	6.00-7.99	8.00-9.99	TOTAL
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
SECTOR												
-N-	.	.	3	21	67	250	354	176	34	9	.	914
-NNE-	.	1	2	9	13	86	217	187	50	11	.	576
-NE-	.	1	2	4	6	31	72	98	52	30	1	297
-ENE-	.	1	3	1	13	20	29	25	15	4	3	114
-E-	.	1	3	2	7	31	15	6	2	.	.	67
-ESE-	.	1	1	6	30	26	9	4	.	.	.	77
-SE-	.	3	5	19	41	81	43	22	.	.	.	214
-SSE-	2	4	22	49	126	192	86	17	4	.	.	502
-S-	2	19	57	126	293	304	91	17	3	.	.	912
-SSW-	4	21	61	142	314	388	196	97	19	4	.	1246
-SW-	3	35	72	128	209	193	125	52	8	1	.	826
-WSW-	7	27	64	83	130	96	50	10	3	1	.	471
-W-	9	30	47	66	95	95	30	5	1	.	.	378
-WNW-	10	39	33	71	107	116	48	29	11	5	.	469
-NW-	2	35	52	79	120	76	38	25	12	13	4	456
-NNW-	1	9	28	66	207	348	120	61	36	20	.	896
-CALM-	2	.	.	.	.	.	.	.	.	.	.	2
TOTAL	42	227	455	872	1778	2333	1523	831	250	98	8	8417

ATTACHMENT V

Unplanned Offsite Releases

CATAWBA NUCLEAR STATION

UNPLANNED RELEASES

(January 1, 2001 through December 31, 2001)

There were no unplanned liquid or gaseous radioactivity releases to the environment in 2001.

ATTACHMENT VI

Assessment of Radiation Dose from

Radioactive Effluents to

Members of the Public

(includes fuel cycle dose calculation results)

CATAWBA NUCLEAR STATION

Assessment of Radiation Dose from Radioactive Effluents to Members of the Public

(January 1, 2001 through December 31, 2001)

This attachment 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 for each calendar quarter for the calendar year of this report, as well as the total dose for the calendar year. This attachment also includes an assessment of radiation doses to the maximum exposed member of the public from all uranium fuel cycle sources within 10 miles of Catawba for the calendar year of this report to show conformance with 40 CFR 190. Methods for calculating the dose contribution from liquid and gaseous effluents are given in the ODCM.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

1st Quarter 2001

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 1 2001 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	CHILD	LIVER	2.78E-01	1.50E+01	1.85E+00

Maximum Organ Dose Receptor Location: 0.5 Mile N
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========================== Quarter 1 2001 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q1 - Maximum Gamma Air Dose	1.93E-03	1.00E+01	1.93E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.97E+01

Q1 - Maximum Beta Air Dose	6.96E-04	2.00E+01	3.48E-03

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.77E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

2nd Quarter 2001

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 2 2001 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	CHILD	LIVER	2.58E-01	1.50E+01	1.72E+00

Maximum Organ Dose Receptor Location: 0.5 Mile N
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Quarter 2 2001 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q2 - Maximum Gamma Air Dose	2.53E-03	1.00E+01	2.53E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.97E+01

Q2 - Maximum Beta Air Dose	9.27E-04	2.00E+01	4.64E-03

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.61E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

3rd Quarter 2001

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 3 2001 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	CHILD	LIVER	1.87E-01	1.50E+01	1.25E+00

Maximum Organ Dose Receptor Location: 0.5 Mile N
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========================= Quarter 3 2001 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q3 - Maximum Gamma Air Dose	2.25E-03	1.00E+01	2.25E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.84E+01

Q3 - Maximum Beta Air Dose	9.30E-04	2.00E+01	4.65E-03

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	8.37E+01
XE-133	9.86E+00
KR-85	5.69E+00

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

4th Quarter 2001

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 4 2001 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	CHILD	LIVER	2.55E-01	1.50E+01	1.70E+00

Maximum Organ Dose Receptor Location: 0.5 Mile N
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========================= Quarter 4 2001 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q4 - Maximum Gamma Air Dose	2.05E-03	1.00E+01	2.05E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.93E+01

Q4 - Maximum Beta Air Dose	7.59E-04	2.00E+01	3.80E-03

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.47E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
GASEOUS ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

ANNUAL 2001

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Annual 2001 ========

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	CHILD	LIVER	9.78E-01	3.00E+01	3.26E+00

Maximum Organ Dose Receptor Location: 0.5 Mile N
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Annual 2001 ========

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Yr - Maximum Gamma Air Dose	8.77E-03	2.00E+01	4.39E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.92E+01

Yr - Maximum Beta Air Dose	3.31E-03	4.00E+01	8.28E-03

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.26E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

1st Quarter 2001

=== BATCH LIQUID RELEASES ========== Quarter 1 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	ADULT	GI-LLI	2.12E-02	1.00E+01	2.12E-01
Q1 - Total Body Dose	TEEN		1.14E-02	3.00E+00	3.80E-01

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
NB-95	3.65E+01
H-3	3.07E+01
CO-60	2.02E+01
MN-54	6.62E+00
C0-58	5.35E+00

Total Body
Critical Pathway: Shoreline Sediment
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
CO-60	4.38E+01
H-3	4.23E+01
CS-137	5.53E+00
CS-134	5.32E+00

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 1 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	ADULT	LIVER	2.58E-04	1.00E+01	2.58E-03
Q1 - Total Body Dose	ADULT		2.58E-04	3.00E+00	8.60E-03

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

2nd Quarter 2001

=== BATCH LIQUID RELEASES ========== Quarter 2 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	ADULT	GI-LLI	2.16E-02	1.00E+01	2.16E-01
Q2 - Total Body Dose	TEEN		1.31E-02	3.00E+00	4.37E-01

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	3.67E+01
NB-95	3.05E+01
CO-60	2.39E+01

Total Body
Critical Pathway: Shoreline Sediment
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
CO-60	4.58E+01
H-3	4.46E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 2 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	ADULT	LIVER	4.92E-04	1.00E+01	4.92E-03
Q2 - Total Body Dose	ADULT		4.92E-04	3.00E+00	1.64E-02

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

3rd Quarter 2001

=== BATCH LIQUID RELEASES ========== Quarter 3 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	TEEN	GI-LLI	2.59E-02	1.00E+01	2.59E-01
Q3 - Total Body Dose	TEEN		1.91E-02	3.00E+00	6.37E-01

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
CO-60	6.24E+01
H-3	1.57E+01
NB-95	1.17E+01
MN-54	6.38E+00

Total Body
Critical Pathway: Shoreline Sediment
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
CO-60	6.03E+01
H-3	2.12E+01
CS-137	1.51E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 3 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	ADULT	LIVER	7.39E-04	1.00E+01	7.39E-03
Q3 - Total Body Dose	ADULT		7.39E-04	3.00E+00	2.46E-02

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

4th Quarter 2001

=== BATCH LIQUID RELEASES ========== Quarter 4 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	ADULT	GI-LLI	4.58E-02	1.00E+01	4.58E-01
Q4 - Total Body Dose	TEEN		1.46E-02	3.00E+00	4.87E-01

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
NB-95	6.22E+01
H-3	1.79E+01
CO-60	1.05E+01
CO-58	5.63E+00

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	4.14E+01
CO-60	3.81E+01
CS-137	1.63E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 4 2001 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	ADULT	LIVER	1.23E-03	1.00E+01	1.23E-02
Q4 - Total Body Dose	ADULT		1.23E-03	3.00E+00	4.10E-02

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/01 TO 1/1/02
LIQUID ANNUAL DOSE SUMMARY REPORT

Catawba Nuclear Station Units 1 & 2

ANNUAL 2001

=== BATCH LIQUID RELEASES ========== Annual 2001 =========

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	ADULT	GI-LLI	1.13E-01	2.00E+01	5.65E-01
Yr - Total Body Dose	TEEN		5.83E-02	6.00E+00	9.72E-01

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
NB-95	4.23E+01
H-3	2.49E+01
CO-60	2.15E+01
MN-54	5.42E+00

Total Body
Critical Pathway: Shoreline Sediment
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
CO-60	4.83E+01
H-3	3.56E+01
CS-137	1.10E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Annual 2001 =========

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	ADULT	LIVER	2.74E-03	2.00E+01	1.37E-02
Yr - Total Body Dose	ADULT		2.74E-03	6.00E+00	4.57E-02

Maximum Organ
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Total Body
Critical Pathway: Fresh Water Fish
Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
H-3	1.00E+02

Catawba Nuclear Station
2001 Radioactive Effluent Releases
40CFR190 Uranium Fuel Cycle Dose* Calculation Results

Maximum Total Body Dose = 1.02E+00 mrem

Maximum Location: 0.5 Mile, North Sector
Critical Age = Child

Liquid and Gas Effluent Contribution to Maximum Total Body Dose

Liquid Effluent Dose = 3.97E-02 mrem = 4% of total

Critical Path = Potable Water
Major Contributors = H-3 (68.9%)
Co-60 (20.0%)
Cs-137 (6.2%)

Gas Effluent Dose = 9.78E-01 mrem = 96% of total

Critical Path = Vegetation
Major Contributor = H-3 (100%)

Maximum Organ Dose = 1.03E+00 mrem

Maximum Location: 0.5 Mile, North Sector
Critical Age = Child
Critical Organ = LIVER

Liquid and Gas Effluent Contribution to Maximum Organ Dose

Liquid Effluent Dose = 5.46E-02 mrem = 5% of total

Critical Path = Fresh Water Fish
Major Contributors = H-3 (50.0%)
Cs-137 (30.2%)
Co-60 (11.5%)

Gas Effluent Dose = 9.78E-01 mrem = 95% of total

Critical Path = Vegetation
Major Contributor = H-3 (100%)

* Annual dose limits from 40CFR190.10(a) of 25 mrem whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.

ATTACHMENT VII

Revisions to the

Updated Final Safety Analysis Report

Radiological Effluent Controls

Section 16.11

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-1 LIQUID EFFLUENTS

COMMITMENT:

The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (see Figure 16.11-1) shall be limited to ten times the effluent concentrations specified in 10 CFR Part 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 2×10^{-4} microCurie/ml total activity.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS exceeding the above limits, immediately restore the concentration to within the above limits.

TESTING REQUIREMENTS:

Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 16.11-1.

The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in the ODCM to assure that the concentrations at the point of release are maintained within the limits of SLC 16.11-1.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 20, Appendix B

BASES:

The basic requirements for Selected Licensee Commitments concerning effluents from nuclear power reactors are stated in 10 CFR 50.36a. These requirements indicate that compliance with effluent Selected Licensee Commitments will keep average annual releases of radioactive material in effluents to small percentages of

BASES (con't)

the limits specified in the old 10 CFR 20.106 (new 10 CFR 20.1302). These requirements further indicate that operational flexibility is allowed, compatible with considerations of health and safety, which may temporarily result in releases higher than such small percentages, but still within the limits specified in the old 10 CFR 20.106 which references Appendix B, Table II concentrations (MPCs). These referenced concentrations are specific values which relate to an annual dose of 500 mrem. It is further indicated in 10 CFR 50.36a that when using operational flexibility, best efforts shall be exerted to keep levels of radioactive materials in effluents as low as is reasonably achievable (ALARA) as set forth in 10 CFR 50, Appendix I.

As stated in the Introduction to Appendix B of the new 10 CFR 20, the liquid effluent concentration (EC) limits given in Appendix B, Table 2, Column 2, are based on an annual dose of 50 mrem. Since a release concentration corresponding to a limiting dose rate of 500 mrem/year has been acceptable as a SLC limit for liquid effluents, which applies at all times as an assurance that the limits of 10 CFR 50, Appendix I are not likely to be exceeded, it should not be necessary to reduce this limit by a factor of 10.

Operational history at Catawba has demonstrated that the use of the concentration values associated with the old 10 CFR 20.106 as SLC limits has resulted in calculated maximum individual doses to a MEMBER OF THE PUBLIC that are small percentages of the limits of 10 CFR 50, Appendix I. Therefore, the use of concentration values which correspond to an annual dose of 500 mrem (ten times the concentration values stated in the new 10 CFR 20, Appendix B, Table 2, Column 2) should not have a negative impact on the ability to continue to operate within the limits of 10 CFR 50, Appendix I and 40 CFR 190.

Having sufficient operational flexibility is especially important in establishing a basis for effluent monitor setpoint calculations. As discussed above, the concentrations stated in the new 10 CFR 20, Appendix B, Table 2, Column 2, relate to a dose of 50 mrem in a year. When applied on an instantaneous basis, this corresponds to a dose rate of 50 mrem/year. This low value is impractical upon which to base effluent monitor setpoint calculations for many liquid effluent release situations when monitor background, monitor sensitivity, and monitor performance must be taken into account.

Therefore, to accommodate operational flexibility needed for effluent releases, the limits associated with SLC 16.11-1 are based on ten times the concentrations stated in the new 10 CFR 20, Appendix B, Table 2, Column 2, to apply at all times. The multiplier of ten is proposed because the annual dose of 500 mrem, upon which the concentrations in the old 10 CFR 20, Appendix B, Table II, Column 2, are based, is a factor of 10 higher than annual dose of 50 mrem, upon which the concentrations in the new 10 CFR 20, Appendix B, Table 2, Column 2, are based. Compliance with

BASES (con't)

the limits of the new 10 CFR 20.1301 will be demonstrated by operating within the limits of 10 CFR 50, Appendix I and 40 CFR 190. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

This commitment applies to the release of radioactive materials in liquid effluents from all units at the site.

The required detection capabilities for radioactive materials in liquid waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination – Application to Radiochemistry," Annal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

TABLE 16.11-1 (Page 1 of 3)

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (•Ci/ml)
1. Batch Waste Release Tanks[2]	P Each Batch	P Each Batch	Principle Gamma Emitters [3]	$5x10^{-7}$
			I-131	$1x10^{-6}$
Any tank which discharges liquid wastes by either liquid effluent monitor, EMF-49 or EMF-57	P One Batch/M	M	Dissolved and Entrained Gases (Gamma emitters)	$1x10^{-5}$
	P Each Batch	M Composite[4]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	P Each Batch	Q Composite[4]	Sr-89, Sr-90	$5x10^{-8}$
2. Continuous Releases[5]	Continuous[6]	W Composite[6]	Principal Gamma Emitters[3]	$5x10^{-7}$
a. Conventional Waste Water Treatment Line				
			I-131	$1x10^{-6}$

M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
Continuous[6]	M Composite[6]	H-3	$1x10^{-5}$
		Gross Alpha	$1x10^{-7}$
Continuous[6]	Q Composite[6]	Sr-89, Sr-90	$5x10^{-8}$

TABLE 16.11-1 (Page 2 of 3)

TABLE NOTATIONS

(1) The LLD is defined, for purposes of these commitments, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \, x \, 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCurie per unit mass or volume),

s_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),

2.22×10^6 = the number of disintegrations per minute per microCurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide (sec^{-1}), and

Δt = the elapsed time between midpoint of sample collection and time of counting (sec).

Typical values of E, V, Y and Δt shall be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

TABLE 16.11-1 (Page 3 of 3)

TABLE NOTATIONS (Continued)

(2) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

(3) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141. The LLD for Ce-144 is 5×10^{-6} µCi/ml. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report pursuant to Technical Specification 5.6.3 in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

(4) A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.

(5) A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

(6) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-2 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

COMMITMENT:

The radioactive liquid effluent monitoring instrumentation channels shown in Table 16.11-2 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of SLC 16.11-1 are not exceeded. The Alarm/Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY:

At all times.

REMEDIAL ACTION:

a. With a radioactive liquid effluent monitoring instrumentation channel Alarm/Trip Setpoint less conservative than required by the above specification, immediately suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 16.11-2. Restore the inoperable instrumentation to OPERABLE status within the time specified in the ACTION, or explain in the next Radioactive Effluent Release Report pursuant to Technical Specification 5.6.3 why this inoperability was not corrected within the time specified.

TESTING REQUIREMENTS:

Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL OPERATIONAL TEST operations at the frequencies shown in Table 16.11-3.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual
2. 10 CFR Part 20
3. 10 CFR Part 50, Appendix A

BASES:

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The Alarm/Trip Setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the Alarm/Trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50.

TABLE 16.11-2 (Page 1 of 2)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	ACTION
1. Radioactivity Monitors Providing Alarm And Automatic Termination of Release		
a. Waste Liquid Discharge Monitor (Low Range – EMF-49)	1 per station	C
b. Turbine Building Sump Monitor (Low Range – EMF-31)	1	E
c. Deleted		
d. Monitor Tank Building Liquid Discharge Monitor (EMF-57)	1 per station	C
2. Continuous Composite Samplers And Sampler Flow Monitor		
a. Conventional Waste Water Treatment Line (no alarm/trip function)	1 per station	E
3. Flow Rate Measurement Devices		
a. Waste Liquid Effluent Line (no alarm/trip function)	1 per station	D
b. Conventional Waste Water Treatment Line (no alarm/trip function)	1 per station	D
c. Low Pressure Service Water Minimum Flow Interlock	1 per station	D
d. Monitor Tank Building Waste Liquid Effluent Line (no alarm/trip function)	1 per station	D

TABLE 16.11-2 (Page 2 of 2)

REMEDIAL ACTION STATEMENTS

ACTION C - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 14 days provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with SLC 16.11-1; and

b. At least two technically qualified members of the facility staff independently verify:

1) The discharge line valving; and,

2) The manual portion of the computer input for the release rate calculations performed on the computer, or the entire release rate calculations if such calculations are performed manually.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION D - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided the flow rate is estimated at least once per 4 hours during actual releases. Pump performance curves generated in place may be used to estimate flow.

ACTION E - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided grab samples are analyzed for radioactivity at a lower limit of detection of no more than 10^{-7} microCurie/ml:

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microCurie/gram DOSE EQUIVALENT I-131, or

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microCurie/gram DOSE EQUIVALENT I-131.

TABLE 16.11-3 (Page 1 of 2)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1.	Radioactivity Monitors Providing Alarm and Automatic Termination of Release				
	a. Waste Liquid Discharge Monitor (Low Range – EMF-49)	D	P	R(2)	Q(1)
	b. Turbine Building Sump Monitor (Low Range – EMF-31)	D	M	R(2)	Q(1)
	c. Deleted				
	d. Monitor Tank Building Liquid Discharge Monitor (EMF-57)	D	P	R(2)	Q(1)
2.	Continuous Composite Samplers and Sampler Flow Monitor				
	a. Conventional Waste Water Treatment Line (no alarm/trip function)	D(3)	N.A.	R	N.A.
3.	Flow Rate Measurement Devices				
	a. Waste Liquid Effluent Line (no alarm/trip function)	D(3)	N.A.	R	N.A.
	b. Conventional Waste Water Treatment Line (no alarm/trip function)	D(3)	N.A.	R	N.A.
	c. Low Pressure Service Water Minimum Flow Interlock	D(3)	N.A.	R	Q
	d. Monitor Tank Building Waste Liquid Effluent Line (no alarm/trip function)	D(3)	N.A.	R	N.A.

TABLE 16.11-3 (Page 2 of 2)

TABLE NOTATIONS

(1) The CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation* occur if any of the following conditions exists:

a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or,

b. Circuit failure/Instrument downscale failure (alarm only)

(2) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Bureau of Standards (NBS) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRAITON, sources that have been related to the initial calibration shall be used.

(3) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

* For EMF-57, the alarm annunciation is in the Monitor Tank Building Control Room and on the MTB Control Panel Remote Annunciator panel.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-3 DOSE

COMMITMENT:

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to UNRESTRICTED AREAS (see Figure 16.11-1) shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrem to the whole body and to less than or equal to 5 mrem to any organ, and

b. During any calendar year to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits. This Special Report shall also include: (1) the results of radiological analyses of the drinking water source, and (2) the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR Part 141, Safe Drinking Water Act.*

TESTING REQUIREMENTS:

Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

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*The requirements of REMEDIAL ACTION (1) and (2) are applicable only if drinking water supply is taken from the receiving water body within 3 miles downstream of the plant discharge.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 40 CFR Part 141

3. 10 CFR Part 50, Appendix I

BASES:

This commitment is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The REMEDIAL ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". Also, for fresh water sites with drinking water supplies that can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR Part 141. The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in 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, "Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I", April 1977.

This commitment applies to the release of radioactive materials in liquid effluents from each unit at the site. When shared Radwaste Treatment Systems are used by more than one unit on a site, the wastes from all units are mixed for shared treatment; by such mixing, the effluent releases cannot accurately be ascribed to a specific unit. An estimate should be made of the contributions from each unit based on input conditions, e.g., flow rates and radioactivity concentrations, or, if not practicable, the treated effluent releases may be allocated equally to each of the radioactive waste producing units sharing the Radwaste Treatment System. For determining conformance to commitments, these allocations from shared Radwaste Treatment Systems are to be added to the releases specifically attributed to each unit to obtain the total releases per unit.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-4 LIQUID RADWASTE TREATMENT SYSTEM

COMMITMENT:

The Liquid Radwaste Treatment System shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent, from each unit, to UNRESTRICTED AREAS (see Figure 16.11-1) would exceed 0.06 mrem to the whole body or 0.2 mrem to any organ in a 31-day period.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the Liquid Radwaste Treatment System not in operation, prepare and submit to the Commission within 30 days a Special Report that includes the following information:

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,

2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

3. Summary description of action(s) taken to prevent a recurrence.

TESTING REQUIREMENTS:

Doses due to liquid releases from each unit to UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in the ODCM when Liquid Radwaste Treatment Systems are not being fully utilized.

The installed Liquid Radwaste Treatment System shall be considered OPERABLE by meeting SLC 16.11-1 and 16.11-3.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix A

3. 10 CFR Part 50, Appendix I

BASES:

The OPERABILITY of the Liquid Radwaste Treatment System ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable". This commitment implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the Liquid Radwaste Treatment System were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

This commitment applies to the release of radioactive materials in liquid effluents from each unit at the site. When shared Radwaste Treatment Systems are used by more than one unit on a site, the wastes from all units are mixed for shared treatment; by such mixing, the effluent releases cannot accurately be ascribed to a specific unit. An estimate should be made of the contributions from each unit based on input conditions, e.g., flow rates and radioactivity concentrations, or, if not practicable, the treated effluent releases may be allocated equally to each of the radioactive waste producing units sharing the Radwaste Treatment System. For determining conformance to SLCs, these allocations from shared Radwaste Treatment Systems are to be added to the releases specifically attributed to each unit to obtain the total releases per unit.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-5 CHEMICAL TREATMENT PONDS

COMMITMENT:

The quantity of radioactive material contained in each chemical treatment pond shall be limited by the following expression:

$$\frac{264}{V} \cdot \sum_{j} \frac{A_j}{(C_j \, x 10)} < 1.0$$

excluding tritium and dissolved or entrained noble gases,

Where:

A_j = pond inventory limit for single radionuclide "j", in Curies

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j", microCuries/ml;

V = design volume of liquid and slurry in the pond, in gallons; and

264 = conversion unit, microCuries/Curie per milliliter/gallon.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the quantity of radioactive material in any of the above listed ponds exceeding the above limit, immediately suspend all additions of radioactive material to the pond and initiate corrective action to reduce the pond contents to within the limit.

TESTING REQUIREMENTS:

The quantity of radioactive material contained in each batch of resin/water slurry to be transferred to the chemical treatment ponds shall be determined to be within the above limit by analyzing a representative sample of the batch to be

TESTING REQUIREMENTS (con't)

transferred to the chemical treatment ponds and shall be limited by the expression:

$$\sum_j \frac{c_j}{(C_j \times 10)} < 0.006$$

Where:

c_j = radioactive resin/water slurry concentration for radionuclide "j" entering the UNRESTRICTED AREA chemical treatment ponds, in microCuries/milliliter; and

C_j = 10 CFR 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j", in microCuries/milliliter.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual
2. 10 CFR Part 20, Appendix B
3. 10 CFR Part 50, Appendix I

BASES:

The inventory limits of the chemical treatment ponds (CTP) are based on limiting the consequences of an uncontrolled release of the pond inventory. The expression in this commitment assumes the pond inventory is uniformly mixed, that the pond is located in an uncontrolled area as defined in 10 CFR Part 20, and that the concentration limit in Note 1 to Appendix B of 10 CFR Part 20 applies.

The batch limits of resin/water slurry transferred to the CTP assure that radioactive material transferred to the CTP are "as low is reasonably achievable" in accordance with 10 CFR 50.36a. The expression in SLC 16.11-5 assures no batch will be transferred to the CTP unless the sum of the ratios of the activity of the radionuclides to their respective concentration limitation is less than the ratio of the 10 CFR Part 50, Appendix I, Section II.A, total body dose level to the instantaneous whole body dose rate limitation, or that:

$$\sum_j \frac{c_j}{(C_j \times 10)} < \frac{3 \text{ mrem/yr}}{500 \text{ mrem/yr}} = 0.006$$

BASES (con't)

Where:

c_j = radioactive resin/water slurry concentration for radionuclide "j" entering the UNRESTRICTED AREA CTP, in microCuries/milliliter; and,

C_j = 10 CFR Part 20, Appendix B, Table 2, Column 2, concentration for single radionuclide "j", in microCuries/milliliter.

The filter/demineralizers using powdered resin and the blowdown demineralizer are backwashed or sluiced to a holding tank. The tank will be agitated to obtain a representative sample of the resin inventory in the tank. A known weight of the wet, drained resin (moisture content approximately 55 to 60%, bulk density of about 58 pounds per cubic foot) will then be counted. The concentration of the resin slurry to be pumped to the chemical treatment ponds will then be determined by the formula:

$$c_j = \frac{Q_j W_R}{V_T}$$

Where:

Q_j = concentration of radioactive materials in wet, drained resin for radionuclide "j", excluding tritium, dissolved or entrained noble gases, and radionuclides with less than an 8-day half-life. The analysis shall include at least Ce-144, Cs-134, Cs-137, Co-58 and Co-60, in microCuries/gram. Estimates of the Sr-89 and Sr-90 batch concentration shall be included based on the most recent monthly composite analysis (within 3 months);

W_R = total weight of resin in the storage tank in grams (determined from chemistry logs procedures); and,

V_T = total volume of resin water mixture in storage tank to be transferred to the chemical treatment ponds in milliliters.

The batch limits provide assurance that activity input to the CTP will be minimized, and a means of identifying radioactive material in the inventory limitation of this commitment.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-6 GASEOUS EFFLUENTS

DOSE RATE

COMMITMENT:

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure 16.11-1) shall be limited to the following:

a. For noble gases: Less than or equal to 500 mrem/yr to the whole body and less than or equal to 3000 mrem/yr to the skin; and,

b. For Iodine-131, for Iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the dose rate(s) exceeding the above limits, immediately restore the release rate to within the above limit(s).

TESTING REQUIREMENTS:

The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM.

The dose rate due to Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 16.11-4.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 20, Appendix B

3. 10 CFR Part 20

BASES:

The basic requirements for Selected Licensee Commitments concerning effluents from nuclear power reactors are stated in 10 CFR 50.36a. These requirements indicate that compliance with effluent Selected Licensee Commitments will keep average annual releases of radioactive material in effluents to small percentages of the limits specified in the old 10 CFR 20.106 (new 10 CFR 20.1301). These requirements further indicate that operational flexibility is allowed, compatible with considerations of health and safety, which may temporarily result in releases higher than such small percentages, but still within the limits specified in the old 10 CFR 20.106 which references Appendix B, Table II concentrations (MPCs). These referenced concentrations are specific values which relate to an annual dose of 500 mrems. It is further indicated in 10 CFR 50.36a that when using operational flexibility, best efforts shall be exerted to keep levels of radioactive materials in effluents as low as is reasonably achievable (ALARA) as set forth in 10 CFR 50, Appendix I.

As stated in the Introduction to Appendix B of the new 10 CFR 20, the gaseous effluent concentration (EC) limits given in Appendix B, Table 2, Column 1, are based on an annual dose of 50 mrems for isotopes for which inhalation or ingestion is limiting or 100 mrems for isotopes for which submersion (noble gases) is limiting. Since release concentrations corresponding to limiting dose rates less than or equal to 500 mrems/year to the whole body, 3000 mrems/year to the skin from noble gases, and 1500 mrems/year to any organ from Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than eight days at the site boundary has been acceptable as a SLC limit for gaseous effluents to assure that the limits of 10 CFR 50, Appendix I and 40 CFR 190 are not likely to be exceeded, it should not be necessary to restrict the operational flexibility by incorporating the dose rate associated with the EC value for isotopes based on inhalation/ingestion (50 mrems/year) or the dose rate associated with the EC value for isotopes based on submersion (100 mrems/ year).

Having sufficient operational flexibility is especially important in establishing a basis for effluent monitor setpoint calculations. As discussed above, the concentrations stated in the new 10 CFR 20, Appendix B, Table 2, Column 1, relate to a dose of 50 or 100 mrems in a year. When applied on an instantaneous basis, this corresponds to a dose rate of 50 or 100 mrems/year.

BASES (con't)

These low values are impractical upon which to base effluent monitor setpoint calculations for many gaseous effluent release situations when monitor background, monitor sensitivity, and monitor performance must be taken into account.

Therefore, to accommodate operational flexibility needed for effluent releases, the limits associated with gaseous release rate SLCs will be maintained at the current instantaneous dose rate limit for noble gases of 500 mrems/year to the whole body and 3000 mrems/year to the skin; and for Iodine-131, for Iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days, an instantaneous dose rate limit of 1500 mrems/year to any organ.

Compliance with the limits of the new 10 CFR 20.1301 will be demonstrated by operating within the limits of 10 CFR 50, Appendix I and 40 CFR 190. Operational history at Catawba has demonstrated that the use of the dose rate values listed above (i.e., 500 mrems/year, 3000 mrems/year, and 1500 mrems/year) as SLC limits has resulted in calculated maximum individual doses to MEMBERS OF THE PUBLIC that are small percentages of the limits of 10 CFR 50, Appendix I and 40 CFR 190. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODCM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrem/year to the whole body or to less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year.

This commitment applies to the release of radioactive materials in gaseous effluents from all units at the site.

The required detection capabilities for radioactive material in gaseous waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination – Application to Radiochemistry", Anal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques", Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

TABLE 16.11-4 (Page 1 of 4)
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD)[1] (μCi/ml)
1. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[2]	$1x10^{-4}$
2. Containment Purge	P Each PURGE[3] Grab Sample	P Each PURGE[3]	Principal Gamma Emitters[2]	$1x10^{-4}$
		M	H-3 (oxide)	$1x10^{-6}$
3. Unit Vent	W[3][4] Grab Sample	W[3]	Principal Gamma Emitters[2]	$1x10^{-4}$
			H-3 (oxide)	$1x10^{-6}$
4. Containment Air Release and Addition System	D[3][5] Grab Sample	D[3][5]	Principal Gamma Emitters[2]	$1x10^{-4}$
		M	H-3 (oxide)	$1x10^{-6}$
5. All Release Types as listed In 3 above.	Continuous[6]	D[7] Charcoal Sample	I-131	$1x10^{-11}$
			I-133	$1x10^{-9}$
	Continuous[6]	D[7] Particulate Sample	Principal Gamma Emitters[2]	$1x10^{-10}$
	Continuous[6]	M Composite Particulate Sample	Gross Alpha[8]	$1x10^{-11}$
	Continuous[6]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$

TABLE 16.11-4 (Page 2 of 4)
RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD)[1] (μCi/ml)
6. Waste Monitor Tank Building Ventilation Exhaust	W Grab Sample	W	Principal Gamma Emitters[2]	$1x10^{-4}$
			H-3 (oxide)	$1x10^{-6}$
	Continuous[6]	W Charcoal Sample	I-131	$1x10^{-11}$
			I-133	$1x10^{-9}$
	Continuous[6]	W Particulate Sample	Principal Gamma Emitters[2]	$1x10^{-10}$
	Continuous[6]	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
	Continuous[6]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$

TABLE 16.11-4 (Page 3 of 4)

TABLE NOTATIONS

(1) THE LLD is defined, for purposes of these commitments, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 x 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (microCurie per unit mass or volume);

s_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute);

E = the counting efficiency (counts per disintegration);

V = the sample size (units of mass or volume);

$2.22 x 10^6$ = the number of disintegrations per minute per microCurie;

Y = the fractional radiochemical yield, when applicable;

λ = the radioactive decay constant for the particular radionuclide (sec^{-1}); and

Δt = the elapsed time between midpoint of sample collection and time of counting (sec).

Typical values of E, V, Y and Δt shall be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

TABLE 16.11-4 (Page 4 of 4)

TABLE NOTATIONS (Continued)

(2) The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 in noble gas releases and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, I-131, Cs-134, Cs-137, and Ce-141 in Iodine and particulate releases. The LLD for Ce-144 is $5x10^{-9}$ μCi/ml. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Radioactive Effluent Release Report, pursuant to Technical Specification 5.6.3, in the format outlined in Regulatory Guide 1.21, Appendix B, Revision 1, June 1974.

(3) Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER stabilization (power level constant at desired power level) after a THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a 1-hour period, for at least one of the three gaseous release types with this notation.

(4) Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

(5) Required sampling and analysis frequency during effluent release via this pathway.

(6) The ratio of the sample flow volume to the sampled stream flow volume shall be known for the time period covered by each dose or dose rate calculation made in accordance with SLCs 16.11-6, 16.11-8, and 16.11-9.

(7) Samples shall be changed at least once per 24 hours and analyses shall be completed within 48 hours after changing, or after removal from sampler.

(8) The composite filter(s) will be analyzed for alpha activity by analyzing one filter per week to ensure that at least four filters are analyzed per collection period.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-7 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

COMMITMENT

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 16.11-5 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of SLC 16.11-6 are not exceeded. The Alarm/Trip Setpoints of these channels meeting SLC 16.11-6 shall be determined and adjusted in accordance with the methodology and parameters in the ODCM.

APPLICABILITY:

As shown in Table 16.11-5.

REMEDIAL ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel Alarm/Trip Setpoint less conservative than required by the above specification, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 16.11-5. Restore the inoperable instrumentation to OPERABLE status within the time specified in the ACTION, or explain in the next Radioactive Effluent Release Report pursuant to Technical Specification 5.6.3 why this inoperability was not corrected within the time specified.

TESTING REQUIREMENTS:

Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST operations at the frequencies shown in Table 16.11-6.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 20

BASES:

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The Alarm/Trip Setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, and 64 of Appendix A to 10 CFR Part 50. The sensitivity of any noble gas activity monitor used to show compliance with the gaseous effluent release requirements of SLC 16.11-8 shall be such that concentrations as low as 1 x 10-6 μCi/cc are measurable.

TABLE 16.11-5 (Page 1 of 5)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

	Instrument	Minimum Channels Operable	Applicability	Action
1.	Waste Gas Holdup System			
	a. Noble Gas Activity Monitor – Providing Alarm and Automatic Termination of Release (Low Range – EMF-50)	1 per station	*	C
	b. Effluent System Flow Rate Measuring Device	1 per station	*	D
2.	Condenser Evacuation System Noble Gas Activity Monitor (Low Range – EMF-33)	1	1,2,3,4,#	H
3.	Vent System			
	a. Noble Gas Activity Monitor (Low Range – EMF-36)	1	**	E
	b. Iodine Sampler (EMF-37)	1	**	G
	c. Particulate Sampler (EMF-35)	1	**	G
	d. Unit Vent Stack Flow Rate Meter (no alarm/trip function)	1	**	D
	e. Unit Vent Radiation Monitor Flow Meter	1	**	G

TABLE 16.11-5 (Page 2 of 5)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

	Instrument	Minimum Channels Operable	Applicability	Action
4.	Containment Purge System			
	Noble Gas Activity Monitor – Providing Alarm and Automatic Termination of Release (Low Range – EMF-39)	1	At all times outside of modes 1,2,3,4	F
5.	Containment Air Release and Addition System			
	Noble Gas Activity Monitor – Providing Alarm (Low Range – EMF-39)	1	1, 2, 3, 4, 5, 6	I
6.	Monitor Tank Building HVAC			
a.	Noble Gas Activity Monitor – Providing Alarm (EMF-58)	1 per station	**	E
b.	Monitor Tank Building Effluent Flow Rate Measuring Device	1 per station	**	D

TABLE 16.11-5 (Page 3 of 5)

TABLE NOTATIONS

* At all times except when the isolation valve is closed and locked.

** At all times.

\# Apply Action Hb in Modes 5 and 6

ACTION STATEMENTS

ACTION C - With the number of channels OPERABLE less than required the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment for up to 14 days provided that prior to initiating the release either:

a. Vent system noble gas activity monitor providing alarm and automatic termination of release (Low Range – EMF-36) has at least one channel OPERABLE; or,

b. At least two independent samples of the tank's contents are analyzed, and at least two technically qualified members of the facility staff independently verify:

1. The discharge valve lineup; and

2. The manual portion of the computer input for the release rate calculations performed on the computer, or the entire release rate calculations if such calculations are performed manually.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION D - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided the flow rate is estimated at least once per 4 hours.

ACTION E - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided grab samples

TABLE 16.11-5 (Page 4 of 5)

TABLE NOTATIONS

are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours.

ACTION F - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, operation may continue with EMF-39 inoperable for up to 12 hours with the affected unit below MODE 4, provided the following conditions are satisfied:

(a) EMF-36 for the affected unit is OPERABLE and in service,
(b) The Reactor Coolant System for the affected unit has been vented, and
(c) If the reactor vessel head is not in place (bolts not required), one of the following two conditions shall be met:
    (c1) All irradiated fuel assemblies have been removed from the containment structure, or
    (c2) The lifting of heavy loads over the reactor vessel and the movement of irradiated fuel assemblies within containment have been suspended.

Otherwise, immediately suspend PURGING of radioactive effluents via this pathway.

ACTION G - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue for up to 30 days provided samples are continuously collected with auxiliary sampling equipment as required in Table 16.11-4.

ACTION H - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement:

a. Effluent release via the CSAE System (ZJ) may continue for up to 30 days provided grab samples are taken at least once per 12 hours and these samples are analyzed for radioactivity within 24 hours, and

b. Gaseous effluent releases via the BB system atmospheric vent valve (BB27) in the off normal mode may continue for up to 30 days provided grab samples of steam generator water are

TABLE 16.11-5 (Page 5 of 5)

TABLE NOTATIONS

analyzed for radioactivity at a lower limit of detection of no more than 1E-7 microCurie/ml:

1. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01: microCurie/gram DOSE EQUIVALENT I-131, or

2. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microCurie/gram DOSE EQUIVALENT I-131.

ACTION I - With the number of channels OPERABLE less than the Minimum Channels OPERABLE requirement, containment releases to the environment through this pathway may continue provided that prior to initiating the release:

a. Vent system noble gas activity monitor providing alarm and automatic termination of release (Low Range – EMF-36) has at least one channel OPERABLE; or,

b. At least two independent samples of the containment atmosphere are analyzed, and at least two technically qualified members of the facility independently verify:

   1. The discharge valve lineup; and

   2. The manual portion of the computer input for the release rate calculations performed on the computer, or the entire release rate calculations if such calculations are performed manually.

Restore the inoperable instrumentation to OPERABLE status within 30 days, or explain in the next Radioactive Effluent Release Report, pursuant to Technical Specification 5.6.3, why this inoperability was not corrected within the time specified.

If the instrumentation remains, or is anticipated to remain, inoperable for 90 days or longer, re-evaluate the configuration of the affected unit in accordance with the applicable portions of 10CFR50.59 and 10CFR50.65(a)(4), prior to expiration of the 90 days.

TABLE 16.11-6 (Page 1 of 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Channel Check	Source Check	Channel Calibration	Channel Operational Test	Modes For Which Surveillance Is Required
1. Waste Gas Holdup System					
a. Noble Gas Activity Monitor – Providing Alarm and Automatic Termination of Release (Low Range – EMF-50)	P	P(4)	R(3)	Q(1)	*
b. Effluent System Flow Rate Measuring Device	P	N.A.	R	N.A.	*
2. Condenser Evacuation System					
Noble Gas Activity Monitor (Low Range – EMF-33) (BB27 is only isolation function required)	D	M(4)	R(3)	Q(1)	1,2,3,4
3. Vent System					
a. Noble Gas Activity Monitor (Low Range – EMF-36)	D	M(4)	R(3)	Q(2)	**
b. Iodine Sampler (EMF-37)	W	N.A.	N.A.	N.A.	**
c. Particulate Sampler (EMF-35)	W	N.A.	N.A.	N.A.	**

TABLE 16.11-6 (Page 2 of 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Channel Check	Source Check	Channel Calibration	Channel Operational Test	Modes For Which Surveillance Is Required
d. Unit Vent Stack Flow Rate Meter (no alarm/trip function)	D	N.A.	R	N.A.	**
e. Unit Vent Radiation Monitor Flow Meter	D	N.A.	R	N.A.	**
4. Containment Purge System					
Noble Gas activity Monitor – Providing Alarm and Automatic Termination of Release (Low Range – EMF-39)	S	P(4)	R(3)	R(1)	During movement of irradiated fuel assemblies in containment; During CORE ALTERATIONS
5. Containment Air Release and Addition System					
Noble Gas Activity Monitor – Providing Alarm (Low Range – EMF-39)	S	P(4)	R(3)	Q(1)	1, 2, 3, 4, 5, 6

TABLE 16.11-6 (Page 3 of 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	Channel Check	Source Check	Channel Calibration	Channel Operational Test	Modes For Which Surveillance Is Required
6. Monitor Tank Building HVAC					
a. Noble Gas Activity Monitor – Providing Alarm (EMF-58)	D	M	R(3)	Q(2)	**
b. Discharge Flow Instrumentation	D	N.A.	R	N.A.	**

TABLE 16.11-6 (Page 4 of 4)

TABLE NOTATIONS

* At all times except when the isolation valve is closed and locked.
** At all times.

1. For noble gas activity monitors providing automatic termination of release, the CHANNEL OPERATIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occur if any of the following conditions exists:

   a. Instrument indicates measured levels above the Alarm/Trip Setpoint; or,

   b. Circuit failure/Instrument downscale failure (Alarm only)

2. The CHANNEL OPERATIONAL TEST shall also demonstrate that control room alarm annunciation[#] occurs if any of the following conditions exists:

   a. Instrument indicates measured levels above the Alarm Setpoint; or,

   b. Circuit failure/Instrument downscale failure

3. The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Bureau of Standards (NBS) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration shall be used.

4. A source check for these channels shall be the qualitative assessment of channel response when the channel sensor is exposed to a light emitting diode.

[#] For EMF-58, the alarm annunciation is in the Monitor Tank Building Control Room and on the MTB Control Panel Remote Annunciator Panel.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-8 DOSE – NOBLE GASES

COMMITMENT:

The air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 16.11-1) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrad for beta radiation; and,

b. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

TESTING REQUIREMENTS:

Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

BASES:

This commitment is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.B of Appendix I. The REMEDIAL ACTION statement provides the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". The Testing Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in 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", Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors", Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

This commitment applies to the release of radioactive materials in gaseous effluents from each unit at the site. When shared Radwaste Treatment Systems are used by more than one unit on a site, the wastes from all units are mixed for shared treatment; by such mixing, the effluent releases cannot accurately be ascribed to a specific unit. An estimate should be made of the contributions from each unit based on input conditions, e.g., flow rates and radioactivity concentrations, or, if not practicable, the treated effluent releases may be allocated equally to each of the radioactives waste producing units sharing the Radwaste Treatment System. For determining conformance to commitments, these allocations from shared Radwaste Treatment Systems are to be added to the releases specifically attributed to each unit to obtain the total releases per unit.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-9 DOSE – IODINE-131, IODINE-133, TRITIUM, AND RADIOACTIVE MATERIAL IN PARTICULATE FORM

COMMITMENT:

The dose to a MEMBER OF THE PUBLIC from Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 16.11-1) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrem to any organ; and,

b. During any calendar year: Less than or equal to 15 mrem to any organ.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the calculated dose from the release of Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

TESTING REQUIREMENTS:

Cumulative dose contributions for the current calendar quarter and current calendar year for Iodine-131, Iodine-133, tritium and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

BASES:

This commitment is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50, and are the guides set forth in Section II.C of Appendix I. The REMEDIAL ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". The ODCM calculational methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in 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", Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors", Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate commitments for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man in the areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of the calculations were: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, (3) deposition onto grassy areas where milk animals and meat-producing animals graze with consumption of the milk and meat by man, and (4) deposition on the ground with subsequent exposure of man.

This commitment applies to the release of radioactive materials in gaseous effluents from each unit at the site. When shared Radwaste Treatment Systems are used by more than one unit on a site, the wastes from all units are mixed for shared treatment; by such mixing, the effluent releases cannot accurately be ascribed to a specific unit. An estimate should be made of the contributions from each unit based on input conditions, e.g., flow rates and radioactivity concentrations, or, if not practicable, the treated effluent releases may be allocated equally to each of the radioactive waste producing units sharing the Radwaste Treatment System. For determining conformance to commitments, these allocations from shared Radwaste Treatment Systems are to be added to the releases specifically attributed to each unit to obtain the total releases per unit.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-10 GASEOUS RADWASTE TREATMENT SYSTEM

COMMITMENT:

The VENTILATION EXHAUST TREATMENT SYSTEM and the WASTE GAS HOLDUP SYSTEM shall be OPERABLE and appropriate portions of these systems shall be used to reduce releases of radioactivity when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure 16.11-1) would exceed either:

a. 0.2 mrad to air from gamma radiation; or,

b. 0.4 mrad to air from beta radiation; or,

c. 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days a Special Report that includes the following information:

1. Identification of any inoperable equipment or subsystems, and the reason for the inoperability;

2. Action(s) taken to restore the inoperable equipment to OPERABLE status; and,

3. Summary description of action(s) taken to prevent a recurrence.

TESTING REQUIREMENTS:

Doses due to gaseous releases from each unit to areas at and beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodology and parameters in the ODCM when Gaseous Radwaste Treatment Systems are not being fully utilized.

TESTING REQUIREMENTS (con't)

The installed VENTILATION EXHAUST TREATMENT SYSTEM and WASTE GAS HOLDUP SYSTEM shall be considered OPERABLE by meeting SLCs 16.11-6, 16.11-8, or 16.11-9.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

BASES:

The OPERABILITY of the WASTE GAS HOLDUP SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable". This commitment implements the requirements of 10 CFR 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

This commitment applies to the release of radioactive materials in gaseous effluents from each unit at the site. When shared Radwaste Treatment Systems are used by more than one unit on a site, the wastes from all units are mixed for shared treatment; by such mixing, the effluent releases cannot accurately be ascribed to a specific unit. An estimate should be made of the contributions from each unit based on input conditions, e.g., flow rates and radioactivity concentrations, or, if not practicable, the treated effluent releases may be allocated equally to each of the radioactive waste producing units sharing the Radwaste Treatment System. For determining conformance to commitments, these allocations from shared Radwaste Treatment Systems are to be added to the releases specifically attributed to each unit to obtain the total releases per unit.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-11 SOLID RADIOACTIVE WASTES

COMMITMENT:

Radioactive wastes shall be solidified or dewatered in accordance with the PROCESS CONTROL PROGRAM to meet shipping and transportation requirements during transit, and disposal site requirements when received at the disposal site.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

a. With SOLIDIFICATION or dewatering not meeting disposal site and shipping and transportation requirements, suspend shipment of the inadequately processed wastes and correct the PROCESS CONTROL PROGRAM, the procedures and/or the Solid Radwaste System as necessary to prevent recurrence.

b. With SOLIDIFICATION or dewatering not performed in accordance with the PROCESS CONTROL PROGRAM, test the improperly processed waste in each container to ensure that it meets burial ground and shipping requirements and take appropriate administrative action to prevent recurrence.

TESTING REQUIREMENTS:

SOLIDIFICATION of at least one representative test specimen from at least every tenth batch of each type of wet radioactive wastes (e.g., filter sludges, spent resins, evaporator bottoms, boric acid solutions and sodium sulfate solutions) shall be verified in accordance with the PROCESS CONTROL PROGRAM:

a. If any test specimen fails to verify SOLIDIFICATION, the SOLIDIFICATION of the batch under test shall be suspended until such time as additional test specimens can be obtained, alternative SOLIDIFICATION parameters can be determined in accordance with the PROCESS CONTROL PROGRAM, and a subsequent test verifies SOLIDIFICATION. SOLIDIFICATION of the batch may then be resumed

TESTING REQUIREMENTS (con't)

using the alternative SOLIDIFICATION parameters determined by the PROCESS CONTROL PROGRAM;

b. If the initial test specimen from a batch of waste fails to verify SOLIDIFICATION, the PROCESS CONTROL PROGRAM shall provide for the collection and testing of representative test specimens from each consecutive batch of the same type of wet waste until at least three consecutive initial test specimens demonstrate SOLIDIFICATION. The PROCESS CONTROL PROGRAM shall be modified as required to assure SOLIDIFICATION of subsequent batches of waste; and,

c. With the installed equipment incapable of meeting SLC 16.11-11 or declared inoperable, restore the equipment to OPERABLE status or provide for contract capability to process wastes as necessary to satisfy all applicable transportation and disposal requirements.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix A

3. 10 CFR Part 50

BASES:

This commitment implements the requirements of 10 CFR 50.36a and General Design Criterion 60 of Appendix A to 10 CFR Part 50. The process parameters included in establishing the PROCESS CONTROL PROGRAM may include, but are not limited to waste type, waste pH, waste/liquid/SOLIDIFICATION agent/catalyst ratios, waste oil content, waste principal chemical constituents, and mixing and curing times.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-12 TOTAL DOSE

COMMITMENT:

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of SLCs 16.11-3a, 16.11-3b, 16.11-8a, 16.11-8b, 16.11-9a, or 16.11-9b, calculations shall be made including direct radiation contributions from the units and from outside storage tanks to determine whether the above limits of this commitment have been exceeded. If such is the case, prepare and submit to the Commission within 30 days a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR 20.405c, shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

TESTING REQUIREMENTS:

Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with SLCs 16.11-3, 16.11-8 and 16.11-9, and in accordance with the methodology and parameters in the ODCM.

TESTING REQUIREMENTS: (cont'd)

Cumulative dose contributions from direct radiation from the units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in the ODCM. This requirement is applicable only under conditions set forth in the REMEDIAL ACTION of this commitment.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 20

3. 40 CFR Part 190

BASES:

This commitment is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20 by 46 FR 18525. The commitment requires the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrem to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem.

For sites containing up to four reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the units and from outside storage tanks are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.2203(a)(4), is considered to be a timely request and fulfills the requirements of 40 CFR part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in SLC 16.11-1 and 16.11-6. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

16.11 RAIOLOGICAL EFFLUENT CONTROLS

16.11-13 MONITORING PROGRAM

COMMITMENT:

The Radiological Environmental Monitoring Program shall be conducted as specified in Table 16.11-7.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

a. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 16.11-7, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report required by Technical Specification 5.6.2, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 16.11-7 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of SLC 16.11-3, 16.11-8, and 16.11-9. When more than one of the radionuclides in Table 16.11-7 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 16.11-7 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to a MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of SLC 16.11-3, 16.11-8 and 16.11-9. This report is not required if the measured level of radioactivity was not the

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* The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

REMEDIAL ACTION (con't)

result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report required by Technical Specification 5.6.2.

c. With milk or fresh leafy vegetation samples unavailable from one or more of the sample locations required by Table 16.11-7, identify specific locations for obtaining replacement samples and add them within 30 days to the Radiological Environmental Monitoring Program given in the ODCM. The specific locations from which samples were unavailable may then be deleted from the monitoring program. Pursuant to Technical Specification 5.5.1, submit in the next Radioactive Effluent Release Report documentation for a change in the ODCM including a revised figure(s) and table for the ODCM reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples and justifying the selection of the new location(s) for obtaining samples.

TESTING REQUIREMENTS:

The radiological environmental monitoring samples shall be collected pursuant to Table 16.11-7 from the specific locations given in the table and figure(s) in the ODCM, and shall be analyzed pursuant to the requirements of Table 16.11-7 and the detection capabilities required by Table 16.11-8.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50 Appendix I

BASES:

The Radiological Environmental Monitoring Program required by this commitment provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the plant operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the Radiological Effluent Monitoring Program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The initially specified monitoring program will be effective for at least the first 3 years of commercial

BASES (con't)

operation. Following this period, program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLDs). The LLDs required by Table 16.11-8 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination – Application to Radiochemistry", Anal. Chem. 40, 586-93 (1968), and Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques", Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

TABLE 16.11-7 (Page 1 of 8)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. Direct Radiation[2]	Forty routine monitoring stations either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows: An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY; An outer ring of stations, one in each meteorological sector in the 6- to 8-km range from the site; and, The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.	Quarterly	Gamma dose quarterly

TABLE 16.11-7 (Page 2 of 8)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
2. Airborne Radioiodine and Particulates	Samples from five locations. Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the highest calculated annual average ground-level D/Q; One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q; and One sample from a control location, as for example 15 to 30 km distant and in the least prevalent wind direction.	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister: I-131 analysis weekly. Particulate Sampler: Gross beta radioactivity analysis following filter change; [3] and gamma isotopic analysis [4] of composite (by location) quarterly.

TABLE 16.11-7 (Page 3 of 8)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne			
a. Surface[5]	One sample upstream. One sample downstream.	Composite sample over 1-month period[6].	Gamma isotopic analysis[4] monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from one or two sources only if likely to be affected[7]	Quarterly	Gamma isotopic[4] and tritium analysis quarterly.
c. Drinking	One sample of each of one to three of the nearest water supplies that could be affected by its discharge. One sample from a control location.	Composite sample over 2-week period[6] when I-131 analysis is performed; monthly composite otherwise.	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year[8]. Composite for gross beta and gamma isotopic analyses[4] monthly. Composite for tritium analysis quarterly.
d. Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually.	Gamma isotopic analysis[4] semiannually.

TABLE 16.11-7 (Page 4 of 8)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion			
a. Milk	Samples from milking animals in three locations within 5-km distance having the highest dose potential. If there are none, then one sample from milking animals in each of three areas between 5 to 8 km distant where doses are calculated to be greater than 1 mrem per year[8]. One sample from milking animals at a control location 15 to 30 km distant and in the least prevalent wind direction.	Semimonthly when animals are on pasture; monthly at other times.	Gamma isotopic[4] and I-131 analysis semi-monthly when animals are on pasture; monthly at other times.
b. Fish and Invertebrates	One sample each of a predatory species, a bottom feeder and a forage species in vicinity of plant discharge area. One sample each of a predatory species, a bottom feeder and a forage species in areas not influenced by plant discharge.	Sample in season, or semiannually if they are not seasonal.	Gamma isotopic analysis[4] on edible portions.

TABLE 16.11-7 (Page 5 of 8)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS[1]	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion (Continued)			
c. Food Products	One sample of each principal class of food products from any area that is irrigated by water in which liquid plant wastes have been discharged.	At time of harvest [9].	Gamma isotopic analyses [4] on edible portion.
	Samples of three different kinds of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground level D/Q if milk sampling is not performed.	Monthly, when available.	Gamma isotopic [4] and I-131 analysis.
	One sample of each of the similar broad leaf vegetation grown 15 to 30 km distant in the least prevalent wind direction if milk sampling is not performed.	Monthly, when available.	Gamma isotopic [4] and I-131 analysis.

TABLE 16.11-7 (Page 6 of 8)

TABLE NOTATIONS

1. Specific parameters of distance and direction sector from the centerline of the station, and additional description where pertinent, shall be provided for each and every sample location in Table 16.11-7 in a table and figure(s) in the ODCM. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to circumstances such as hazardous conditions, seasonal unavailability, and malfunction of automatic sampling equipment. If specimens are unobtainable due to sampling equipment malfunction, effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the Radiological Environmental Monitoring Program. In lieu of any Licensee Event Report required 10 CFR 50.73 and pursuant to Technical Specification 5.6.3, identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in the next Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

2. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. (The 40 stations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., at an ocean site, some sectors will be over water so that the number of dosimeters may be reduced accordingly. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information within minimal fading.)

TABLE 16.11-7 (Page 6 of 8)

TABLE NOTATIONS (Cont'd)

3. Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

4. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

5. The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area beyond but near the mixing zone. "Upstream" samples in an estuary must be taken far enough upstream to be beyond the plant influence. Salt water shall be sampled only when the receiving water is utilized for recreational activities.

6. A composite sample is one in which the rate at which the liquid sampled is uniform and in which the method of sampling employed results in a specimen that is representative of the time averaged concentration at the location being sampled. In this program composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.

7. Groundwater samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

8. The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the ODCM.

9. If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuberous and root food products.

TABLE 16.11-7 (Page 8 of 8)

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

REPORTING LEVELS

ANALYSIS	WATER (pCi/l)	AIRBOURNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	Milk (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
H-3	20,000[1]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(1) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

LOWER LIMIT OF DETECTION (LLD)[3]

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1[4]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.

TABLE 16.11-8 (Page 2 of 3)

TABLE NOTATIONS

1. This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2.

2. Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.

3. The LLD is defined, for purposes of these commitments, as the smallest concentrations of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

   For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\, s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (picoCuries per unit mass or volume);

s_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute);

E = the counting efficiency (counts per disintegration);

V = the sample size (units of mass or volume);

2.22 = the number of disintegrations per minute per picoCurie;

Y = the fractional radiochemical yield, when applicable;

λ = the radioactive decay constant the particular radionuclide (sec^{-1}); and,

TABLE 16.11-8 (Page 3 of 3)

TABLE NOTATIONS (Cont'd)

Δt = the elapsed time between environmental collection, or end of the sample collection period, and time of counting (sec).

Typical values of E, V, Y and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2.

4. LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-14 LAND USE CENSUS

COMMITMENT:

A Land Use Census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence, and the nearest garden* of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

a. With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in SLC 16.11-9, identify the new location(s) in the next Radioactive Effluent Release Report pursuant to Technical Specification5.6.3.

b. With a Land Use Census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with SLC 16.11-13, add the new location(s) within 30 days to the Radiological Environmental Monitoring Program given in the ODCM. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Pursuant to Technical Specification 5.5.1, submit in the next Radioactive Effluent Release Report documentation for a change in the ODCM including a revised figure(s) and table(s) for the ODCM reflecting the new location(s), with information supporting the change in the sampling locations.

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* Broad leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Commitments for broad leaf vegetation sampling in Table 16.11-7.4.c shall be followed, including analysis of control samples.

TESTING REQUIREMENTS:

The Land Use Census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

BASES:

This commitment is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the Radiological Environmental Monitoring Program given in the ODCM are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantify (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) a vegetation yield of 2 kg/m^2.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-15 INTERLABORATORY COMPARISON PROGRAM

COMMITMENT:

Analyses shall be performed on all radioactive materials, supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission, that correspond to samples required by Table 16.11-7.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2.

TESTING REQUIREMENTS:

The Interlaboratory Comparison Program shall be described in the ODCM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report pursuant to Technical Specification 5.6.2.

REFERENCES:

1. Catawba Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

BASES:

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11-16 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT AND RADIOACTIVE EFFLUENT RELEASE REPORT

COMMITMENT:

16.11-16.1 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT*

Routine Annual Radiological Environmental Operating Reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 15 of each year.

The Annual Radiological Environmental Operating Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of the land use census.

The Annual Radiological Environmental Operating Reports shall include the results of analysis of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the Table and Figures in the ODCM, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the Radiological Environmental Monitoring Program; at least two legible maps** covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by SLC 16.11-15; discussion of all

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* A single submittal may be made for the station.

** One map shall cover stations near the SITE BOUNDARY, and a second map shall include the more distant stations.

COMMITMENT (con't)

deviations from the sampling schedule of Table 16.11-7; and discussion of all analyses in which the LLD required by Table 16.11-8 was not achievable.

16.11-16.2 RADIOACTIVE EFFLUENT RELEASE REPORT (See Note)

The Radioactive Effluent Release Report covering the operation of the unit during the previous calendar year shall be submitted before May 1 of each year. The Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit.

The Radioactive Effluent Release Report shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. [In lieu of submission with the Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.] This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBER OF THE PUBLIC due to their activities inside the SITE BOUNDARY during the report period. All assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. A five-year average of representative onsite meteorological data shall be used in the gaseous effluent dose pathway calculations. Dispersion factors (χ/Qs) and deposition factors (D/Qs) shall be generated using the computer code XOQDOQ (NUREG/CR-2919) which implements NRC Regulatory Guide 1.111. The meteorological conditions concurrent with the time of release shall be reviewed annually to determine if the five-year average values should be revised. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the OFFSITE DOSE CALCULATION MANUAL (ODCM).

The Radioactive Effluent Release Report shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation". Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1, October 1977.

COMMITMENT (con't)

The Radioactive Effluent Release Reports shall include the following information for each type of solid waste shipped offsite during the report period:

a. Total Container volume, in cubic meters,

b. Total Curie quantity (determined by measurement or estimate),

c. Principal radionuclides (determined by measurement or estimate),

d. Type of waste (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

e. Number of shipments, and

f. Solidification agent or absorbent (e.g., cement or other approved agents (media)).

The Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to SLC 16.11-14.

Note:

A single submittal may be made for the station. The submittal should combine those sections that are common to both units.

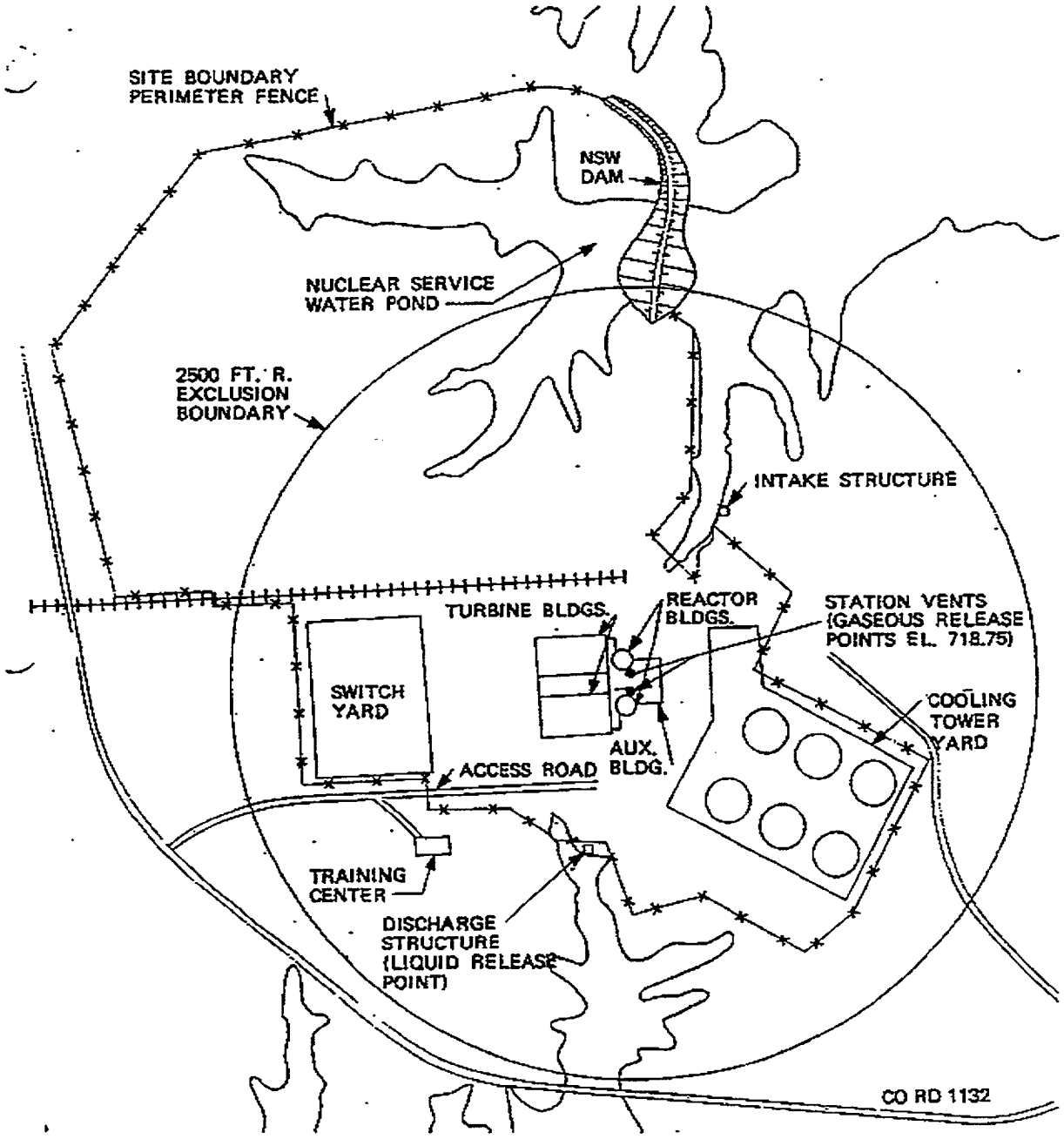

Figure 16.11-1 UNRESTRICTED AREA AND SITE BOUNDARY FOR RADIOACTIVE EFFLUENTS

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-17 LIQUID HOLDUP TANKS

COMMITMENT:

The quantity of radioactive material contained in each temporary unprotected outdoor tank shall be limited to less than or equal to 10 Curies, excluding tritium and dissolved or entrained noble gases.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the quantity of radioactive material in any of the above tanks exceeding the above limit, immediately suspend all additions of radioactive material to the tank, within 48 hours reduce the tank contents to within the limit, and describe the events leading to this condition in the next Radioactive Effluent Release Report, pursuant to Technical Specification 5.6.3.

TESTING REQUIREMENTS:

The quantity of radioactive material contained in each of the above tanks shall be determined to be within the above limit by analyzing a representative sample of the tank's contents at least once per 7 days when radioactive materials are being added to the tank.

REFERENCES:

1. Letter from NRC to Gary R. Peterson, Duke, Issuance of Improved Technical Specifications Amendments for Catawba, September 30, 1998.

2. Technical Specification 5.5.12, Explosive Gas and Storage Tank Radioactivity Monitoring Program.

BASES:

The tanks included in this COMMITMENT are all those outdoor radwaste tanks that are not surrounded by liners, dikes or walls capable of holding the tank contents and

BASES (con't)

that do not have tank overflows and surrounding area drains connected to the Liquid Radwaste Treatment System.

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tank's contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, Table II, Column 2, at the nearest potable water supply and the nearest surface water supply in an UNRESTRICTED AREA.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-18 EXPLOSIVE GAS MIXTURE

COMMITMENT:

The concentration of oxygen in the WASTE GAS HOLDUP SYSTEM shall be limited to less than or equal to 2% by volume whenever the hydrogen concentration exceeds 4% by volume.

APPLICABILITY:

At all times.

REMEDIAL ACTION:

a. With the concentration of oxygen in the WASTE GAS HOLDUP SYSTEM greater than 2% by volume but less than or equal to 4% by volume, reduce the oxygen concentration to the above limits within 48 hours.

b. With the concentration of oxygen in the WASTE GAS HOLDUP SYSTEM greater than 4% by volume and the hydrogen concentration greater than 4% by volume, immediately suspend all additions of waste gases to the system and reduce the concentration of oxygen to less than or equal to 4% by volume; then take REMEDIAL ACTION a. above.

TESTING REQUIREMENTS:

The concentrations of hydrogen and oxygen in the WASTE GAS HOLDUP SYSTEM shall be determined to be within the above limits by continuously monitoring the waste gases in the WASTE GAS HOLDUP SYSTEM with the hydrogen and oxygen monitors required OPERABLE by Table 16.11-20A of SLC 16.11-20.

REFERENCES:

1. Letter from NRC to Gary R. Peterson, Duke, Issuance of Improved Technical Specifications Amendments for Catawba, September 30, 1998.

2. Technical Specification 5.5.12, Explosive Gas and Storage Tank Radioactivity Monitoring Program.

BASES:

This COMMITMENT is provided to ensure that the concentration of potentially explosive gas mixtures contained in the WASTE GAS HOLDUP SYSTEM is maintained below the flammability limits of hydrogen and oxygen. (Automatic control features are included in the system to prevent the hydrogen and oxygen concentrations from reaching these flammability limits. These automatic control features include isolation of the source of hydrogen and/or oxygen, automatic diversion to recombiners, or injection of dilutants to reduce the concentration below the flammability limits.) Maintaining the concentration of hydrogen and oxygen below their flammability limits provides assurance that the releases of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-19 GAS STORAGE TANKS

COMMITMENT:

The quantity of radioactivity contained in each gas storage tank shall be limited to less than or equal to 97,000 Curies of noble gases (considered as Xe-133 equivalent).

APPLICABILITY:

At all times.

REMEDIAL ACTION:

With the quantity of radioactive material in any gas storage tank exceeding the above limit, immediately suspend all additions of radioactive material to the tank and within 48 hours reduce the tank contents to within the limit, and describe the events leading to this condition in the next Radioactive Effluent Release Report pursuant to Technical Specification 5.6.3.

TESTING REQUIREMENTS:

The quantity of radioactive material contained in each gas storage tank shall be determined to be within the above limit at least once per 24 hours when radioactive materials are being added to the tank.

REFERENCES:

1. Letter from NRC to Gary R. Peterson, Duke, Issuance of Improved Technical Specifications Amendments for Catawba, September 30, 1998.

2. Technical Specification 5.5.12, Explosive Gas and Storage Tank Radioactivity Monitoring Program.

BASES:

The tanks included in this COMMITMENT are those tanks for which the quantity of radioactivity contained is not limited directly or indirectly by another COMMITMENT. Restricting the quantity of radioactivity contained in each gas storage tank provides assurance that in the event of an uncontrolled release of the tank's contents, the

BASES (con't)

resulting whole body exposure to a MEMBER OF THE PUBLIC at the nearest SITE BOUNDARY will not exceed 0.5 rem. This is consistent with Standard Review Plan 11.3, Branch Technical Position ETSB 11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure", in NUREG-0800, July 1981.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-20 EXPLOSIVE GAS MONITORING INSTRUMENTATION

COMMITMENT:

The explosive gas monitoring instrumentation channels shown in Table 16.11-20A shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of SLC 16.11-18 are not exceeded.

APPLICABILITY:

During WASTE GAS HOLDUP SYSTEM operation.

REMEDIAL ACTION:

a. With an explosive gas monitoring instrumentation channel Alarm/Trip setpoint less conservative than required by the above COMMITMENT, declare the channel inoperable and take the REMEDIAL ACTION shown in Table 16.11-20A.

b. With less than the minimum number of explosive gas monitoring instrumentation channels operable, take the REMEDIAL ACTION shown in Table 16.11-20A. Restore the inoperable instrumentation to OPERABLE status within 30 days, or if unsuccessful, prepare and submit a Special Report to the Commission to explain why this inoperability was not corrected within the time specified.

TESTING REQUIREMENTS:

Each explosive gas monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST operations at the frequencies shown in Table 16.11-20B.

REFERENCES:

1. Letter from NRC to Gary R. Peterson, Duke, Issuance of Improved Technical Specifications Amendments for Catawba, September 30, 1998.

BASES:

The explosive gas instrumentation is provided for monitoring (and controlling) the concentrations of potentially explosive gas mixtures in the WASTE GAS HOLDUP SYSTEM.

TABLE 16.11-20A

EXPLOSIVE GAS MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	REMEDIAL ACTION
WASTE GAS HOLDUP SYSTEM Explosive Gas Monitoring System		
a. Hydrogen Monitors	1/train per station	C
b. Oxygen Monitors	2/train per station	D

TABLE NOTATIONS

REMEDIAL ACTION STATEMENTS

ACTION C - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, suspend oxygen supply to the recombiner.

ACTION D - With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, operation of this system may continue provided grab samples are taken and analyzed at least once per 24 hours. With both channels inoperable, operation may continue provided grab samples are taken and analyzed at least once per 4 hours during degassing operations and at least once per 24 hours during other operations.

TABLE 16.11-20B

EXPLOSIVE GAS MONITORING INSTRUMENTATION TESTING REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
WASTE GAS HOLDUP SYSTEM Explosive Gas Monitoring System			
a. Hydrogen Monitors	24 hours	92 days (1)	31 days
b. Oxygen Monitors	24 hours	92 days (2)	31 days

(1) The CHANNEL CALIBRATION shall include the use of standard gas samples in accordance with the manufacturer's recommendations. In addition, a standard gas sample of nominal four volume percent hydrogen, balance nitrogen, shall be used in the calibration to check linearity of the hydrogen analyzer.

(2) The CHANNEL CALIBRATION shall include the use of standard gas samples in accordance with the manufacturer's recommendations. In addition, a standard gas sample of nominal four percent oxygen, balance nitrogen, shall be used in the calibration to check linearity of the oxygen analyzer.

16.11 RADIOLOGICAL EFFLUENTS CONTROLS

16.11-21 MAJOR CHANGES TO LIQUID, GASEOUS, AND SOLID RADWASTE TREATMENT SYSTEMS

COMMITMENT:

Licensee-initiated major changes to the Radwaste Treatment Systems (liquid, gaseous, and solid):

a. Shall be reported* to the Commission in the Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the Station Manager. The discussion of each change shall contain:

1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;

2) Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

3) A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems;

4) An evaluation of the change, which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste that differ from those previously predicted in the License application and amendments thereto;

5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the License application and amendments thereto;

6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period prior to when the changes are to be made;

7) An estimate of the exposure to plant operating personnel as a result of the change; and

* Licensees may choose to submit the information called for in this Commitment as part of the periodic UFSAR update.

COMMITMENT (con't)

8) Documentation of the fact that the change was reviewed and found acceptable by the Station Manager or the Chemistry Manager.

b. Shall become effective upon review and acceptance by a qualified individual/organization.

REMEDIAL ACTIONS:

None

TESTING REQUIREMENTS:

None

REFERENCES:

1. Letter from NRC to Gary R. Peterson, Duke, Issuance of Improved Technical Specifications Amendments for Catawba, September 30, 1998.

BASES:

None