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

Subject: Duke Energy Carolinas, LLC
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Annual Radioactive Effluent Release Report

Pursuant to the requirements of Technical Specification 5.6.3 and Section 16.11.17 of the Selected Licensee Commitments (SLC) Manual, attached is the Annual Radioactive Effluent Release Report. Also included in this report is a CD-Rom of the Offsite Dose Calculation Manual (Revision 54) pursuant to the requirements of Technical Specification 5.5.1. The following Attachments form the contents of the report:

Attachment 1 - Summary of Gaseous and Liquid Effluents Report
Attachment 2 - Supplemental Information
Attachment 3 - Solid Radioactive Waste Disposal Report
Attachment 4 - Meteorological Data
Attachment 5 - Unplanned Offsite Releases
Attachment 6 - Assessment of Radiation Dose from Radioactive Effluents to Members of the Public (Includes Fuel Cycle Dose Calculation Results)
Attachment 7 - Revisions to the Updated Final Safety Analysis Report Radiological Effluent Controls Section 16.11
Attachment 8 - Revisions to the Radioactive Waste Process Control Program Manual (CD-Rom)
Attachment 9 - Information to Support the Nuclear Energy Institute (NEI) Groundwater Protection Initiative
Attachment 10 - Non-Functional Monitoring Equipment
Attachment 11 - Radioactive Waste Systems Changes

Questions concerning this report should be directed to Kay Crane, McGuire Regulatory Affairs at (980) 875-4306.

S D Capps

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Attachments

A009
IE48
NRR

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Attachment 1

Summary of Gaseous and Liquid Effluents Report

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
A. Fission and Activation Gases						
1. Total Release	Ci	5.50E-01	5.96E-01	5.63E-01	3.88E-01	2.10E+00
2. Avg. Release Rate	µCi/sec	7.00E-02	7.58E-02	7.08E-02	4.88E-02	6.63E-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	6.56E-06	9.97E-07	7.55E-06
2. Avg. Release Rate	µCi/sec	0.00E+00	0.00E+00	8.25E-07	1.25E-07	2.39E-07
D. Tritium						
1. Total Release	Ci	2.00E+01	2.62E+01	2.85E+01	4.94E+01	1.24E+02
2. Avg. Release Rate	µCi/sec	2.54E+00	3.33E+00	3.59E+00	6.22E+00	3.92E+00
E. Carbon-14						
1. Total Release	Ci	5.44E+00	5.40E+00	4.89E+00	3.56E+00	1.93E+01
2. Avg. Release Rate	µCi/sec	6.92E-01	6.87E-01	6.15E-01	4.48E-01	6.10E-01
F. Gross Alpha Radioactivity						
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

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS EFFLUENTS - ELEVATED RELEASES - CONTINUOUS MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	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 **		.....	.....	.....	.....	.....
5. Carbon-14						
** No Nuclide Activities **		.....	.....	.....	.....	.....
6. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS EFFLUENTS - ELEVATED RELEASES - BATCH MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	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 **		.....	.....	.....	.....	.....
5. Carbon-14						
** No Nuclide Activities **		.....	.....	.....	.....	.....
6. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS EFFLUENTS - GROUND RELEASES - CONTINUOUS MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	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						
CO-58	Ci	0.00E+00	0.00E+00	0.00E+00	9.97E-07	9.97E-07
CO-60	Ci	0.00E+00	0.00E+00	6.56E-06	0.00E+00	6.56E-06
Totals for Period...	Ci	0.00E+00	0.00E+00	6.56E-06	9.97E-07	7.55E-06
4. Tritium						
H-3	Ci	1.96E+01	2.56E+01	2.62E+01	4.77E+01	1.19E+02
5. Carbon-14						
C-14	Ci	1.63E+00	1.62E+00	1.47E+00	1.07E+00	5.79E+00
6. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 1C

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS EFFLUENTS - GROUND RELEASES - BATCH MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Gases						
AR-41	Ci	5.30E-01	5.76E-01	5.35E-01	3.76E-01	2.02E+00
KR-85	Ci	1.57E-03	0.00E+00	4.93E-04	1.67E-04	2.23E-03
XE-131M	Ci	1.09E-05	0.00E+00	0.00E+00	0.00E+00	1.09E-05
XE-133	Ci	1.87E-02	2.02E-02	2.77E-02	1.08E-02	7.74E-02
XE-133M	Ci	4.51E-06	0.00E+00	0.00E+00	0.00E+00	4.51E-06
XE-135	Ci	2.02E-06	0.00E+00	1.65E-04	1.07E-03	1.24E-03
Totals for Period...	Ci	5.50E-01	5.96E-01	5.63E-01	3.88E-01	2.10E+00
2. Iodines						
** No Nuclide Activities **		.....	.....	.....	.....	.....
3. Particulates Half Life >= 8 days						
** No Nuclide Activities **		.....	.....	.....	.....	.....
4. Tritium						
H-3	Ci	3.62E-01	6.13E-01	2.36E+00	1.67E+00	5.01E+00
5. Carbon-14						
C-14	Ci	3.81E+00	3.78E+00	3.43E+00	2.50E+00	1.35E+01
6. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
A. Fission and Activation Products						
1. Total Release	Ci	8.50E-03	4.17E-03	1.80E-03	7.61E-03	2.21E-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	9.66E-12	4.13E-12	1.92E-12	9.60E-12	6.10E-12
B. Tritium						
1. Total Release	Ci	1.89E+02	2.25E+02	3.61E+02	2.70E+02	1.05E+03
2. Average Diluted Concentration						
a. Continuous Releases	µCi/ml	8.39E-09	5.58E-09	2.06E-08	2.18E-07	4.58E-08
b. Batch Releases	µCi/ml	2.15E-07	2.22E-07	3.85E-07	3.35E-07	2.87E-07
C. Dissolved and Entrained Gases						
1. Total Release	Ci	1.09E-05	2.66E-05	0.00E+00	0.00E+00	3.75E-05
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	1.24E-14	2.64E-14	0.00E+00	0.00E+00	1.04E-14
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	7.49E+07	7.07E+07	1.99E+08	2.83E+08	6.28E+08
2. Batch Releases	liters	8.77E+05	7.90E+05	3.42E+06	1.33E+06	6.41E+06
F. Volume of Dilution Water						
1. Continuous Releases	liters	4.29E+10	3.71E+10	3.03E+10	2.21E+10	1.32E+11
2. Batch Releases	liters	8.80E+11	1.01E+12	9.36E+11	7.93E+11	3.62E+12

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID EFFLUENTS - CONTINUOUS MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Products						
** No Nuclide Activities **		.....	.....	.....	.....	.....
2. Tritium						
H-3	Ci	3.60E-01	2.07E-01	6.29E-01	4.89E+00	6.09E+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 1/1/12 TO 1/1/13
LIQUID EFFLUENTS - BATCH MODE

McGuire Nuclear Station Units 1 & 2

REPORT FOR 2012	Unit	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
1. Fission and Activation Products						
AG-108M	Ci	0.00E+00	2.19E-05	7.93E-06	2.67E-06	3.25E-05
AG-110M	Ci	0.00E+00	6.90E-06	7.85E-06	9.51E-06	2.43E-05
BE-7	Ci	1.17E-03	5.31E-04	1.31E-05	0.00E+00	1.71E-03
CE-141	Ci	0.00E+00	0.00E+00	1.00E-06	0.00E+00	1.00E-06
CO-57	Ci	3.15E-06	2.23E-06	0.00E+00	9.42E-07	6.33E-06
CO-58	Ci	1.48E-03	6.29E-04	2.56E-04	1.87E-03	4.23E-03
CO-60	Ci	1.77E-03	1.75E-03	1.16E-03	1.10E-03	5.78E-03
CR-51	Ci	2.41E-04	7.73E-06	0.00E+00	3.21E-03	3.46E-03
CS-134	Ci	0.00E+00	0.00E+00	0.00E+00	4.36E-06	4.36E-06
CS-136	Ci	0.00E+00	0.00E+00	0.00E+00	1.54E-06	1.54E-06
CS-137	Ci	1.30E-05	1.56E-06	8.59E-06	2.86E-05	5.18E-05
FE-59	Ci	6.46E-06	0.00E+00	0.00E+00	9.97E-05	1.06E-04
I-131	Ci	0.00E+00	1.46E-06	0.00E+00	0.00E+00	1.46E-06
K-40	Ci	1.08E-05	0.00E+00	0.00E+00	0.00E+00	1.08E-05
MN-54	Ci	1.14E-04	1.04E-04	7.08E-05	7.31E-05	3.62E-04
NA-24	Ci	1.99E-06	0.00E+00	0.00E+00	0.00E+00	1.99E-06
NB-95	Ci	2.86E-04	1.03E-04	0.00E+00	6.75E-05	4.57E-04
NB-97	Ci	1.68E-06	2.12E-06	3.81E-06	6.26E-06	1.39E-05
SB-124	Ci	3.63E-04	4.51E-05	0.00E+00	2.25E-04	6.33E-04
SB-125	Ci	2.85E-03	9.21E-04	2.69E-04	8.86E-04	4.93E-03
SB-126	Ci	0.00E+00	5.27E-07	0.00E+00	0.00E+00	5.27E-07
TE-123	Ci	3.42E-05	6.86E-06	0.00E+00	0.00E+00	4.11E-05
TE-131M	Ci	0.00E+00	0.00E+00	0.00E+00	5.64E-06	5.64E-06
TE-132	Ci	0.00E+00	0.00E+00	0.00E+00	1.12E-06	1.12E-06
ZN-65	Ci	1.82E-05	0.00E+00	0.00E+00	2.25E-06	2.04E-05
ZR-95	Ci	1.34E-04	3.60E-05	0.00E+00	1.94E-05	1.89E-04
Totals for Period...	Ci	8.50E-03	4.17E-03	1.80E-03	7.61E-03	2.21E-02
2. Tritium						
H-3	Ci	1.89E+02	2.25E+02	3.60E+02	2.65E+02	1.04E+03
3. Dissolved and Entrained Gases						
XE-133	Ci	1.09E-05	2.61E-05	0.00E+00	0.00E+00	3.69E-05
XE-135	Ci	0.00E+00	5.91E-07	0.00E+00	0.00E+00	5.91E-07
Totals for Period...	Ci	1.09E-05	2.66E-05	0.00E+00	0.00E+00	3.75E-05
4. Gross Alpha Radioactivity						
** No Nuclide Activities **		.....	.....	.....	.....	.....

Attachment 2

Supplemental Information

McGuire 2012 ARERR - Carbon-14 Supplemental Information

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

In Regulatory Guide 1.21, Revision 2, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste", the NRC recommends U.S. nuclear power plants evaluate whether C-14 is a "principal radionuclide", and if so, report the amount of C-14 released. At McGuire, improvements over the years in effluent management practices and fuel performance have resulted in a decrease in gaseous radionuclide (non-C-14) concentrations, and a change in the distribution of gaseous radionuclides released to the environment. As a result, C-14 has become a "principal radionuclide" for the gaseous effluent pathway at McGuire, as defined in Regulatory Guide 1.21, Rev. 2. McGuire's 2012 Annual Radioactive Effluent Release Report (ARERR) contains estimates of C-14 radioactivity released in 2012, and estimates of public dose resulting from the C-14 effluent.

Because the dose contribution of C-14 from liquid radioactive waste is much less than that contributed by gaseous radioactive waste, evaluation of C-14 in liquid radioactive waste at McGuire is not required (Ref. Reg. Guide 1.21, Rev. 2). The quantity of gaseous C-14 released to the environment can be estimated by use of a C-14 source term scaling factor based on power generation (Ref. Reg. Guide 1.21, Rev. 2). Many documents provide information related to the magnitude of C-14 in typical effluents from commercial nuclear power plants. Those documents suggest that nominal annual releases of C-14 in gaseous effluents are approximately 5 to 7.3 curies from PWRs (Ref. Reg. Guide 1.21, Rev. 2). A more recent study recommends a higher C-14 gaseous source term scaling factor of approximately 9.0 to 9.8 Ci/GWe-yr for a PWR (Westinghouse) (Ref. EPRI 1021106). For the 2012 McGuire ARERR a source term scaling factor of 9.4 Ci/GWe-yr is assumed. Using a source term scaling factor of 9.4 Ci/GWe-yr and actual electric generation (MWe-hrs) from McGuire in 2012 results in a site total C-14 gaseous release estimate to the environment of ~20 Curies. 70% of the C-14 gaseous effluent is assumed to be from batch releases (e.g. WGDTs), and 30% of C-14 gaseous effluent is assumed to be from continuous releases through the unit vents (ref. IAEA Technical Reports Series no. 421, "Management of Waste Containing Tritium and Carbon-14", 2004).

C-14 releases in PWRs occur primarily as a mix of organic carbon and carbon dioxide released from the waste gas system. Since the PWR operates with a reducing chemistry, most, if not all, of the C-14 species initially produced are organic (e.g., methane). As a general rule, C-14 in the primary coolant is essentially all organic with a large fraction as a gaseous species. Any time the RCS liquid or gas is exposed to an oxidizing environment (e.g. during shutdown or refueling), a slow transformation from an organic to an inorganic chemical form can occur. Various studies documenting measured C-14 releases from PWRs suggest a range of 70% to 95% organic with an average of 80% organic with the remainder being CO_2 (Ref. EPRI TR-105715). For the McGuire 2012 ARERR a value of 80% organic C-14 is assumed.

Public dose estimates from airborne C-14 are performed using dose models in NUREG-0133 and Regulatory Guide 1.109. The dose models and assumptions used are documented in the McGuire ODCM. The estimated C-14 dose impact on the maximum organ dose from airborne effluents released from McGuire in 2012 is well below the 10CFR50, Appendix I, ALARA design objective (i.e., 15 mrem/yr per unit).

McGUIRE NUCLEAR STATION

2012 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. GASEOUS EFFLUENTS - 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

ANALYSES OF SPECIFIC RADIONUCLIDES IN SELECTED OR COMPOSITED SAMPLES AS DESCRIBED IN THE SELECTED LICENSEE COMMITMENTS ARE USED TO DETERMINE THE RADIONUCLIDE COMPOSITION OF THE EFFLUENT. A SUMMARY DESCRIPTION OF THE METHOD USED FOR ESTIMATING OVERALL ERRORS ASSOCIATED WITH RADIOACTIVITY MEASUREMENTS IS PROVIDED AS PART OF THE "SUPPLEMENTAL INFORMATION" ATTACHMENT.

V. BATCH RELEASES

A. LIQUID EFFLUENT
1. 2.13E+02 = TOTAL NUMBER OF BATCH RELEASES
2. 2.66E+04 = TOTAL TIME (MIN.) FOR BATCH RELEASES.
3. 5.82E+03 = MAXIMUM TIME (MIN.) FOR A BATCH RELEASE.
4. 1.25E+02 = AVERAGE TIME (MIN.) FOR A BATCH RELEASE.
5. 2.00E+00 = MINIMUM TIME (MIN.) FOR A BATCH RELEASE.
6. 1.81E+06 = AVERAGE DILUTION WATER FLOW DURING RELEASES (GPM).

B. GASEOUS EFFLUENT
1. 3.70E+01 = TOTAL NUMBER OF BATCH RELEASES.
2. 1.05E+06 = TOTAL TIME (MIN.) FOR BATCH RELEASES.
3. 4.48E+04 = MAXIMUM TIME (MIN.) FOR A BATCH RELEASE.
4. 2.84E+04 = AVERAGE TIME (MIN.) FOR A BATCH RELEASE.
5. 1.70E+02 = MINIMUM TIME (MIN.) FOR A BATCH RELEASE.

VI. ABNORMAL RELEASES

(SEE "UNPLANNED OFFSITE RELEASES" ATTACHMENT)

McGUIRE NUCLEAR STATION

Overall Estimate of Error for Effluent Radioactivity Release Reported

The estimated percentage of overall error for both Liquid and Gaseous effluent release data at McGuire Nuclear Station has been determined to be ± 30.3%. 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 Statistical Error	= ± 20%
(3) Calibration Error	= ± 10%
(4) Calibration Source Error	= ± 2.5%
(5) Sample Preparation Error	= ± 3%

Attachment 3

Solid Radioactive Waste Disposal Report

REPORT PERIOD
JANUARY - DECEMBER 2012

McGUIRE NUCLEAR STATION
SOLID RADIOACTIVE WASTE SHIPPED TO DISPOSAL FACILITIES

TYPES OF WASTES SHIPPED	Number of Shipments	Number of Containers	Container Type	Disposal Volume ft^3	m^3	Waste Class	Total Curies
Waste from Liquid Systems							
(A) dewatered powdex resin (brokered)	none						
(B) dewatered powdex resin	none						
(C) dewatered bead resin (brokered)	none						
(D) dewatered bead resin	none						
(E) dewatered radwaste system resin	none						
(F) dewatered primary bead resin	none						
(G) dewatered mechanical filter media	none						
(H) dewatered mechanical filter media (brokered)	none						
(I) solidified waste	none						
Dry Solid Waste							
(A) dry active waste (compacted)	none						
dry active waste (non-compacted)	none						
dry active waste (brokered/compacted)	none						
dry active waste (brokered/non-compacted)	18	44	DBP	3990.57	113.00	A/U	2.544E-01
(B) sealed sources/smoke detectors	none						
(C) sealed sources	none						
(D) irradiated components	none						
Totals	**18**	**44**		**3990.57**	**113.00**		**2.544E-01**

2/4/2013

MCGUIRE NUCLEAR SITE
SUMMARY OF MAJOR RADIONUCLIDE COMPOSITION
2012

Type of waste	Nuclide	% Abundance
1. Waste from liquid systems:		
A. Dewatered Powdex Resin (brokered)	No shipments in 2012	
B. Dewatered Powdex Resin	No shipments in 2012	
C. Dewatered Bead Resin (brokered)	No shipments in 2012	
D. Dewatered Bead Resin	No shipments in 2012	
E. Dewatered Radwaste System Resin (brokered)	No shipments in 2012	
F. Dewatered Primary Bead Resin (brokered)	No Shipments in 2012	
G. Dewatered Mechanical Filter Media	No shipments in 2012	
H. Dewatered Mechanical Filter Media (brokered)	No shipments in 2012	
I. Solidified Waste	No shipments in 2012	
2. Dry Solid Waste:		
A. Dry Active Waste (compacted)	Compaction no longer performed on-site.	
Dry Active Waste (non-compacted)	No shipments in 2012	
Dry Active Waste (brokered/compacted)	No shipments in 2012	

Dry Active Waste (brokered/non-compacted)

2012- 0001	Nuclide	%Abundance
	Cr-51	23.36
	Mn-54	2.49
	Co-57	.09
	Co-58	24.82
	Co-60	14.06
	Cs-137	.16
	Fe-55	7.32
	Fe-59	.63
	Ni-63	1.05
	Zr-95	10.59
	Ce-144	.59
	Sb-124	.60
	Sb-125	1.14
	Sn-113	.48
	Zn-65	.48
	Nb-95	12.14

2012- 0002	Nuclide	%Abundance
	Cr-51	29.45
	Mn-54	2.03
	Co-57	.07
	Co-58	23.37
	Co-60	11.02
	Cs-137	.12
	Fe-55	5.79
	Fe-59	.66
	Ni-63	.81
	Zr-95	10.14
	Ce-144	.48
	Sb-124	.58
	Sb-125	.90
	Sn-113	.41
	Zn-65	.40
	Nb-95	13.75

2012- 0003	Nuclide	%Abundance
	Cr-51	26.16
	Mn-54	2.27
	Co-57	.08
	Co-58	24.16
	Co-60	12.64
	Cs-137	.14
	Fe-55	6.62
	Fe-59	.64
	Ni-63	.94
	Zr-95	10.37
	Ce-144	.54
	Sb-124	.59
	Sb-125	1.03
	Sn-113	.45
	Zn-65	.44
	Nb-95	12.91

2012- 0004	Nuclide	%Abundance
	Cr-51	.79
	Mn-54	2.23
	Co-57	.08
	Co-58	1.50
	Co-60	43.66
	Cs-137	.12
	Fe-55	37.55
	Ni-63	6.04
	H-3	1.03
	C-14	.05
	Zr-95	1.56
	Ce-144	.26
	Sb-125	2.32
	Sn-113	.19
	Nb-95	2.12

2012- 0005	Nuclide	%Abundance
	Co-60	14.59
	Cs-137	4.31
	Fe-55	8.85
	Ni-63	58.62
	H-3	13.30
	C-14	.04
	Sb-125	.16
	Sr-90	.03
	Pu-241	.11

2012- 0007	Nuclide	%Abundance
	Cr-51	1.12
	Mn-54	2.76
	Co-57	.08
	Co-58	1.70
	Co-60	42.90
	Cs-137	.11
	Fe-55	37.03
	Ni-63	5.90
	H-3	1.01
	C-14	.05
	Zr-95	1.80
	Ce-144	.27
	Sb-125	2.29
	Sn-113	.21
	Nb-95	2.78

2012- 0008	Nuclide	%Abundance
	Cr-51	1.37
	Mn-54	2.77
	Co-57	.08
	Co-58	1.83
	Co-60	42.35
	Cs-137	.11
	Fe-55	36.70
	Ni-63	5.80
	H-3	.99
	C-14	.05
	Zr-95	1.96
	Ce-144	.27
	Sb-125	2.26
	Sn-113	.21
	Nb-95	3.25

2012- 0011	Nuclide	%Abundance
	Cr-51	1.41
	Mn-54	2.78
	Co-57	.08
	Co-58	1.85
	Co-60	42.27
	Cs-137	.11
	Fe-55	36.63
	Ni-63	5.79
	H-3	.99
	C-14	.05
	Zr-95	1.98
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.32

2012- 0013	Nuclide	%Abundance
	Cr-51	1.07
	Mn-54	2.76
	Co-57	.08
	Co-58	1.68
	Co-60	43.04
	Cs-137	.11
	Fe-55	37.09
	Ni-63	5.91
	H-3	1.01
	C-14	.05
	Zr-95	1.78
	Ce-144	.27
	Sb-125	2.29
	Sn-113	.20
	Nb-95	2.67

2012- 0014	Nuclide	%Abundance
	Cr-51	1.64
	Mn-54	2.78
	Co-57	.08
	Co-58	1.95
	Co-60	41.78
	Cs-137	.11
	Fe-55	36.35
	Ni-63	5.70
	H-3	.98
	C-14	.04
	Zr-95	2.10
	Ce-144	.27
	Sb-125	2.24
	Sn-113	.22
	Nb-95	3.75

2012- 0015	Nuclide	%Abundance
	Cr-51	1.56
	Mn-54	2.77
	Co-57	.08
	Co-58	1.92
	Co-60	42.07
	Cs-137	.11
	Fe-55	36.36
	Ni-63	5.73
	H-3	.98
	C-14	.05
	Zr-95	2.06
	Ce-144	.27
	Sb-125	2.24
	Sn-113	.22
	Nb-95	3.59

2012- 0016	Nuclide	%Abundance
	Cr-51	1.52
	Mn-54	2.77
	Co-57	.08
	Co-58	1.90
	Co-60	42.06
	Cs-137	.11
	Fe-55	36.48
	Ni-63	5.75
	H-3	.99
	C-14	.05
	Zr-95	2.04
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.52

2012- 0018	Nuclide	%Abundance
	Cr-51	1.58
	Mn-54	2.78
	Co-57	.08
	Co-58	1.93
	Co-60	41.96
	Cs-137	.11
	Fe-55	36.39
	Ni-63	5.73
	H-3	.98
	C-14	.05
	Zr-95	2.06
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.62

2012- 0020	Nuclide	%Abundance
	Cr-51	1.54
	Mn-54	2.78
	Co-57	.08
	Co-58	1.91
	Co-60	42.00
	Cs-137	.11
	Fe-55	36.45
	Ni-63	5.75
	H-3	.98
	C-14	.05
	Zr-95	2.05
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.56

2012- 0023	Nuclide	%Abundance
	Cr-51	1.55
	Mn-54	2.78
	Co-57	.08
	Co-58	1.91
	Co-60	41.99
	Cs-137	.11
	Fe-55	36.45
	Ni-63	5.74
	H-3	.99
	C-14	.05
	Zr-95	2.05
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.58

2012- 0024	Nuclide	%Abundance
	Cr-51	1.52
	Mn-54	2.78
	Co-57	.08
	Co-58	1.91
	Co-60	42.05
	Cs-137	.11
	Fe-55	36.44
	Ni-63	5.75
	H-3	.98
	C-14	.05
	Zr-95	2.04
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.54

2012- 0027	Nuclide	%Abundance
	Cr-51	1.44
	Mn-54	2.77
	Co-57	.08
	Co-58	1.87
	Co-60	42.14
	Cs-137	.11
	Fe-55	36.64
	Ni-63	5.78
	H-3	.99
	C-14	.05
	Zr-95	2.00
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.39

2012- 0029	Nuclide	%Abundance
	Cr-51	1.51
	Mn-54	2.77
	Co-57	.08
	Co-58	1.90
	Co-60	42.04
	Cs-137	.11
	Fe-55	36.56
	Ni-63	5.74
	H-3	.98
	C-14	.05
	Zr-95	2.03
	Ce-144	.27
	Sb-125	2.25
	Sn-113	.22
	Nb-95	3.50

B. Sealed Sources	No shipments in 2012
C. Sealed Sources/Smoke Detectors	No shipments in 2012
D. Irradiated Components	No shipments in 2012

Attachment 4

Meteorological Data

JFD MNS 2012		SECTOR															
		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
STAB	WSCLS(m/s)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	0.46-0.75																
	0.76-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.01-1.25	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.26-1.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	1.51-2.00	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	1
	2.01-3.00	4	1	2	0	1	0	0	0	2	0	0	0	0	0	0	0
	3.01-4.00	0	0	0	0	0	0	0	0	0	1	3	0	1	0	0	1
	4.01-5.00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	5.01-6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.01-8.00	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	8.01-10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B	0.46-0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.76-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.01-1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.26-1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.51-2.00	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
	2.01-3.00	0	0	0	1	3	0	0	0	0	3	0	0	1	0	0	0
	3.01-4.00	0	0	0	2	3	0	0	0	1	1	2	3	0	0	0	0
	4.01-5.00	1	0	2	0	1	0	0	0	0	2	4	1	0	0	0	0
	5.01-6.00	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	6.01-8.00	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
	8.01-10.00	1	1	0	0	0	0	0	0	0	0	0	0	0	0	7	11
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5

C	0.46-0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.76-1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.01-1.25	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	1.26-1.50	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
	1.51-2.00	7	3	4	3	1	1	0	1	1	0	3	1	4	1	2	3
	2.01-3.00	2	4	8	10	5	2	0	1	2	13	11	8	3	2	1	1
	3.01-4.00	0	4	10	10	1	1	1	0	10	12	16	19	3	0	1	1
	4.01-5.00	0	7	12	2	1	1	0	0	2	6	19	4	0	0	1	0
	5.01-6.00	3	4	6	0	0	0	0	0	0	1	16	1	2	2	3	1
	6.01-8.00	4	4	1	0	0	0	0	0	0	0	3	7	2	14	12	17
	8.01-10.00	1	3	0	0	0	0	0	0	0	0	0	0	0	6	7	4
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
D	0.46-0.75	1	2	0	0	0	0	0	0	1	0	0	1	1	1	2	0
	0.76-1.00	3	4	1	0	1	0	1	2	1	1	1	1	2	1	3	5
	1.01-1.25	8	6	2	5	3	3	3	2	5	3	2	5	7	4	10	10
	1.26-1.50	31	23	17	10	6	9	13	15	13	14	11	12	20	18	12	17
	1.51-2.00	63	51	54	54	28	26	44	28	44	30	55	63	45	50	18	35
	2.01-3.00	105	122	223	142	117	82	109	61	104	160	298	155	61	51	33	65
	3.01-4.00	57	108	221	90	77	35	15	10	38	81	221	90	36	29	46	31
	4.01-5.00	46	83	199	38	4	5	7	2	5	16	95	42	30	31	50	39
	5.01-6.00	44	39	106	6	3	1	1	0	1	8	60	15	16	24	33	30
	6.01-8.00	36	24	6	1	1	2	0	0	0	3	23	6	12	25	32	28
	8.01-10.00	2	5	0	0	0	0	0	0	0	0	3	3	1	9	9	7
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3	2
E	0.46-0.75	0	1	0	1	0	1	1	2	3	5	1	3	0	1	1	0
	0.76-1.00	2	0	3	1	3	3	5	6	10	6	13	7	3	4	3	2
	1.01-1.25	4	1	3	4	3	3	4	6	9	9	16	20	11	5	0	2

	1.26-1.50	3	1	3	5	2	5	11	24	23	23	15	30	17	9	5	6
	1.51-2.00	7	3	13	6	8	13	31	51	71	73	74	52	20	13	10	5
	2.01-3.00	13	16	18	10	13	13	65	28	103	132	188	77	20	22	15	10
	3.01-4.00	8	2	4	1	1	2	13	6	6	15	62	18	7	10	11	8
	4.01-5.00	3	1	4	2	2	1	0	2	2	1	10	8	4	5	8	8
	5.01-6.00	1	2	1	0	0	0	1	0	0	0	2	1	6	0	0	0
	6.01-8.00	5	0	1	0	0	0	0	0	0	0	0	3	0	0	1	1
	8.01-10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0.46-0.75	0	0	0	0	0	0	1	0	6	5	4	3	2	1	0	2
	0.76-1.00	1	1	0	1	2	0	0	2	8	12	18	8	8	3	0	1
	1.01-1.25	0	1	1	0	0	2	1	5	6	26	19	5	4	2	0	1
	1.26-1.50	0	2	0	0	1	2	6	9	10	21	12	12	8	3	0	1
	1.51-2.00	1	0	2	1	1	1	0	13	35	34	29	19	10	3	2	0
	2.01-3.00	0	0	1	0	0	0	1	5	35	32	38	18	6	0	1	0
	3.01-4.00	0	1	0	0	0	0	0	0	0	0	5	1	1	1	2	1
	4.01-5.00	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0
	5.01-6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6.01-8.00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	8.01-10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0.46-0.75	1	0	0	1	0	1	0	3	3	16	22	4	1	0	1	0
	0.76-1.00	2	0	0	0	0	0	0	1	6	46	20	14	6	2	1	1
	1.01-1.25	0	2	0	1	0	0	0	0	7	34	17	7	3	0	1	0
	1.26-1.50	0	0	0	0	0	0	0	1	6	19	9	4	5	0	0	0
	1.51-2.00	0	0	0	0	0	0	0	0	11	18	1	3	2	0	0	0
	2.01-3.00	0	0	0	0	0	0	0	0	3	4	5	3	1	0	0	0

3.01-4.00	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
4.01-5.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.01-6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.01-8.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.01-10.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10.01-Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Attachment 5

Unplanned Offsite Releases

July 30, 2012

Memorandum To: Annual Radioactive Effluent Release Report

CC: Steve Mooneyhan, H. J. Sloan, Chris Whitener, C.D. Ingram, Kay Crane, Duncan Brewer

From: William C. Spencer
RP Staff
Radiation Protection
McGuire Nuclear Station

Re: Unplanned release to the Unit 1 Vent Reference PIP M-12-4994

Event Summary:
See referenced PIP for details.
On the morning of 7/16/12 the waste gas (WG) system was shut down for maintenance activities on three WG valves associated with Waste Gas Decay Tank E (WGDT-E).
WGDTs D, E and F were isolated for the work on valves 1WG-252, 1WG-090 and 1WG-102. The system was breeched and shortly after a Chemistry Supervisor monitoring WGDT pressures via the Operator Aid Computer (PI) data points noted WGDT-E was indicating a loss of pressure. Chemistry technicians were contacted and increased monitoring of all WGDTs was put into place to verify pressure changes to validate pressure loss in the WGDT-E tank.
Operations Shift Manager (OSM) and Radiation Protection (RP) were notified and trending of Unit Vent gas monitor (1EMF 36) as well as the Auxiliary bld noble gas monitor (0EMF 41 point 4) showed no increase above background for the period. Local gas grab samples were collected in the area of the system breech. No radioactivity was identified.
On 7-20-12 the waste gas system was re-started and WGDT-E was sampled to evaluate the radioactive gas released to the Unit 1 Vent during this event. The total Noble gas activity released (1.13E-4 Curies) was conservatively reported on (GWR) Gaseous Waste Release (GWR) # 2012040.
The unplanned release of radioactivity was evaluated against off site dose limits using current ODCM methodology on the attached spreadsheet.

Safety Significance:
The health and safety of the public were not compromised by this event. The total Noble gas activity released was 0.00011 curies. Calculated dose and doserate to the Total Body, Skin, Gamma Air, and Beta Air were all orders of magnitude below the limits specified by Selected Licensee Commitments and Code of Federal Regulations.

W C Spencer

W.C. Spencer
RP Staff Support
Radiation Protection
McGuire Nuclear Station

H J Sloan

Harry J Sloan
General Supervisor
Radiation Protection
McGuire Nuclear Station

Unplanned Release on 7/16/12								
PIP M-12-4994								
Release Summary	**SLC Limits**	**Release**	**% of Limit**					
Total Body Doserate (mrem/yr)	500	5.11E-07	**1.02E-07**					
Skin + Gamma Air Doserate (mrem/yr)	3000	3.18E-05	**1.06E-06**					
Gamma Air Dose (mrad)	40	6.51E-09	**1.63E-08**					
Beta Air Dose (mrad)	20	5.26E-07	**2.63E-06**					
Release Duration (sec)	3.64E+05							
Release Volume (cu. ft.)	700							
Release Duration (min)	6065							
Average Release Rate (cu.ft. per min)	0.12							
Average Release Rate (cu meters per sec)	5.45E-05							
Average X/Q (sec per cu meter)	7.611E-05				**Total Body**	**Skin + 1.1*Gamma Air**	**Gamma Air**	**Beta Air**
WGDT 'E' Sample	**uci/cc**	**Curies**	**Ci/sec**	**Ci/m^3 @ SB**	**mrem/yr**	**mrem/yr**	**mrad**	**mrad**
Kr-85	5.58E-06	1.11E-04	3.04E-10	2.31E-14	3.72E-07	3.14E-05	4.59E-09	5.20E-07
Kr-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-133	1.13E-07	2.25E-06	6.18E-12	4.70E-16	1.38E-07	3.26E-07	1.91E-09	5.70E-09
Xe-133 M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ar-41	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		1.13E-04			**5.11E-07**	**3.18E-05**	**6.51E-09**	**5.26E-07**
ODCM Values from Appendix A	**Ki**	**Li**	**Mi**	**Ni**				
Kr-85	16.1	1340	17.2	1950				
Kr-87	5920	9730	6170	10300				
Xe-133	294	306	353	1050				
Xe-133m	251	994	327	1480				
Xe-135	1810	1860	1920	2460		Ki= Total Body Dose Factor		
Kr-85M	1170	1460	1230	1970		Li= Skin Dose Factor		
Kr-88	14700	2370	15200	2930		Mi= Gamma Air Dose Factor		
Ar-41	8840	2690	9300	3280		Ni= Beta Air Dose Factor		

Attachment 6

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

(Includes fuel cycle dose calculation results)

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

1st Quarter 2012

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS ======= Quarter 1 2012 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	CHILD	BONE	2.47E-01	1.50E+01	1.65E+00

Maximum Organ Dose Receptor Location: 1.5 Mile NE
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
C-14	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS ========== Quarter 1 2012 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q1 - Maximum Gamma Air Dose	1.19E-02	1.00E+01	1.19E-01

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.99E+01

Q1 - Maximum Beta Air Dose	4.25E-03	2.00E+01	2.12E-02

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.87E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

2nd Quarter 2012

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 2 2012 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	CHILD	BONE	2.45E-01	1.50E+01	1.63E+00

Maximum Organ Dose Receptor Location: 1.5 Mile NE
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
C-14	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Quarter 2 2012 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q2 - Maximum Gamma Air Dose	1.29E-02	1.00E+01	1.29E-01

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.99E+01

Q2 - Maximum Beta Air Dose	4.61E-03	2.00E+01	2.30E-02

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.89E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

3rd Quarter 2012

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 3 2012 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	CHILD	BONE	2.22E-01	1.50E+01	1.48E+00

Maximum Organ Dose Receptor Location: 1.5 Mile NE
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
C-14	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Quarter 3 2012 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q3 - Maximum Gamma Air Dose	1.20E-02	1.00E+01	1.20E-01

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.98E+01

Q3 - Maximum Beta Air Dose	4.31E-03	2.00E+01	2.15E-02

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.83E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

4th Quarter 2012

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======= Quarter 4 2012 ====

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	CHILD	BONE	1.61E-01	1.50E+01	1.08E+00

Maximum Organ Dose Receptor Location: 1.5 Mile NE
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
C-14	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Quarter 4 2012 ====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q4 - Maximum Gamma Air Dose	8.45E-03	1.00E+01	8.45E-02

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.98E+01

Q4 - Maximum Beta Air Dose	3.01E-03	2.00E+01	1.50E-02

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.89E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
GASEOUS ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

ANNUAL 2012

=== IODINE, H3, AND PARTICULATE DOSE LIMIT ANALYSIS======== Annual 2012========

Period-Limit	Critical Group	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	CHILD	BONE	8.75E-01	3.00E+01	2.92E+00

Maximum Organ Dose Receptor Location: 1.5 Mile NE
Critical Pathway: Vegetation

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
C-14	1.00E+02

=== NOBLE GAS DOSE LIMIT ANALYSIS========== Annual 2012========

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Yr - Maximum Gamma Air Dose	4.53E-02	2.00E+01	2.27E-01

Maximum Gamma Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.98E+01

Yr - Maximum Beta Air Dose	1.62E-02	4.00E+01	4.04E-02

Maximum Beta Air Dose Receptor Location: 0.5 Mile NNE

Major Isotopic Contributors (5% or greater to total)

Nuclide	Percentage
AR-41	9.87E+01

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

1st Quarter 2012

=== BATCH LIQUID RELEASES ========== Quarter 1 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	CHILD	GI-LLI	2.36E-02	1.00E+01	2.36E-01
Q1 - Total Body Dose	CHILD		2.25E-02	3.00E+00	7.49E-01

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

Nuclide	Percentage
H-3	9.50E+01

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

Nuclide	Percentage
H-3	9.97E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 1 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Maximum Organ Dose	CHILD	LIVER	8.75E-04	1.00E+01	8.75E-03
Q1 - Total Body Dose	CHILD		8.75E-04	3.00E+00	2.92E-02

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

Nuclide	Percentage
H-3	1.00E+02

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

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

2nd Quarter 2012

=== BATCH LIQUID RELEASES ========== Quarter 2 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	CHILD	GI-LLI	2.36E-02	1.00E+01	2.36E-01
Q2 - Total Body Dose	CHILD		2.32E-02	3.00E+00	7.75E-01

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

Nuclide	Percentage
H-3	9.83E+01

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

Nuclide	Percentage
H-3	9.98E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 2 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Maximum Organ Dose	CHILD	LIVER	5.82E-04	1.00E+01	5.82E-03
Q2 - Total Body Dose	CHILD		5.82E-04	3.00E+00	1.94E-02

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

Nuclide	Percentage
H-3	1.00E+02

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

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

3rd Quarter 2012

=== BATCH LIQUID RELEASES ========== Quarter 3 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	CHILD	LIVER	4.07E-02	1.00E+01	4.07E-01
Q3 - Total Body Dose	CHILD		4.06E-02	3.00E+00	1.35E+00

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

Nuclide	Percentage
H-3	9.98E+01

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

Nuclide	Percentage
H-3	9.99E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 3 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q3 - Maximum Organ Dose	CHILD	LIVER	2.18E-03	1.00E+01	2.18E-02
Q3 - Total Body Dose	CHILD		2.18E-03	3.00E+00	7.26E-02

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

Nuclide	Percentage
H-3	1.00E+02

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

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

4th Quarter 2012

=== BATCH LIQUID RELEASES ========== Quarter 4 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	CHILD	GI-LLI	3.57E-02	1.00E+01	3.57E-01
Q4 - Total Body Dose	CHILD		3.54E-02	3.00E+00	1.18E+00

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

Nuclide	Percentage
H-3	9.90E+01

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

Nuclide	Percentage
H-3	9.98E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Quarter 4 2012 ======

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Maximum Organ Dose	CHILD	LIVER	2.30E-02	1.00E+01	2.30E-01
Q4 - Total Body Dose	CHILD		2.30E-02	3.00E+00	7.68E-01

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

Nuclide	Percentage
H-3	1.00E+02

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

Nuclide	Percentage
H-3	1.00E+02

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
PERIOD 1/1/12 TO 1/1/13
LIQUID ANNUAL DOSE SUMMARY REPORT

McGuire Nuclear Station Units 1 & 2

ANNUAL 2012

=== BATCH LIQUID RELEASES ========== Annual 2012 ========

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	CHILD	GI-LLI	1.22E-01	2.00E+01	6.12E-01
Yr - Total Body Dose	CHILD		1.21E-01	6.00E+00	2.01E+00

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

Nuclide	Percentage
H-3	9.84E+01

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

Nuclide	Percentage
H-3	9.98E+01

=== CONTINUOUS LIQUID RELEASES (WC) ========== Annual 2012 ========

Period-Limit	Critical Age	Critical Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Yr - Maximum Organ Dose	CHILD	LIVER	1.92E-02	2.00E+01	9.60E-02
Yr - Total Body Dose	CHILD		1.92E-02	6.00E+00	3.20E-01

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

Nuclide	Percentage
H-3	1.00E+02

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

Nuclide	Percentage
H-3	1.00E+02

McGuire Nuclear Station
2012 Radioactive Effluent and ISFSI
40CFR190 Uranium Fuel Cycle Dose Calculation Results

In accordance with the requirements of 40CFR190, the annual dose commitment to any member of the general public shall be calculated to assure that doses are limited to 25 millirems to the total body or any organ with the exception of the thyroid which is limited to 75 millirems. The fuel cycle dose assessment for McGuire Nuclear Station only includes liquid and gaseous effluent dose contributions from McGuire and direct and air-scatter dose from McGuire's onsite Independent Spent Fuel Storage Installation (ISFSI) since no other uranium fuel cycle facility contributes significantly to McGuire's maximum exposed individual. Included in the gaseous effluent dose calculations is an estimate of the dose contributed by Carbon-14 (Ref. *"Carbon-14 Supplemental Information"*, contained in the ARERR for further information). The combined dose to a maximum exposed individual from McGuire's effluent releases and direct and air-scatter dose from McGuire's ISFSI is below 40CFR190 limits as shown by the following summary:

I. 2012 McGuire 40CFR190 Effluent Dose Summary

The 40CFR190 effluent dose analysis to the maximum exposed individual from liquid and gas releases includes the dose from noble gases (i.e., total body and skin).

Maximum Total Body Dose = 4.12E-01 mrem

Maximum Location: 1.5 Mile, Northeast Sector
Critical Age: Child
Gas non-NG Contribution: 70%
Gas NG Contribution: <1%
Liquid Contribution: 29%

Maximum Organ (other than TB) Dose = 8.76E-01 mrem

Maximum Location: 1.5 Mile, Northeast Sector
Critical Age: Child
Critical Organ: Bone
Gas Contribution: 100%
Liquid Contribution: <1%

II. 2012 McGuire 40CFR190 ISFSI Dose Summary

Direct and air-scatter radiation dose contributions from the onsite Independent Spent Fuel Storage Installation (ISFSI) at McGuire have been calculated and documented in the "McGuire Nuclear Site 10CFR72.212 Evaluation Report". **The maximum dose rate to the nearest real individual from the McGuire ISFSI is conservatively calculated to be less than 4 mrem/yr.**

The attached excerpt from the "McGuire Nuclear Site 10CFR72.212 Evaluation Report" is provided to document the method used to calculate the McGuire ISFSI less than 4 mrem/year dose estimate to the nearest real individual.

6.0 *10 CFR 72.212(b)(5)(iii) - Radioactive Materials in Effluents and Direct Radiation*

6.1 Purpose

10 CFR 72.212(b)(5)(iii) requires the general licensee to perform written evaluations, before use and before applying the changes authorized by an amended CoC to a cask loaded under the initial CoC or an earlier amended CoC, that establish that the requirements of 10 CFR 72.104 have been met. A copy of this record shall be retained until spent fuel is no longer stored under the general license issued under 10 CFR 72.210.

10 CFR 72.104 provides the regulatory criteria for radioactive materials in effluents and direct radiation from an independent spent fuel storage installation (ISFSI) during normal operation and anticipated occurrences. Specifically, 10 CFR 72.104(a) limits the annual dose equivalent to any real individual who is located beyond the controlled area to 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other critical organ. This dose equivalent must include contributions from (1) planned discharges of radioactive materials (radon and its decay products excepted) to the general environment, (2) direct radiation from ISFSI operations, and (3) any other radiation from uranium fuel cycle operations within the region. In addition, 10 CFR 72.104(b) requires that operational restrictions be established to meet as low as is reasonably achievable (ALARA) objectives for radioactive materials in effluents and direct radiation levels associated with ISFSI operations. Also, 10 CFR 72.104(c) requires that operational limits be established for radioactive materials in effluents and direct radiation levels associated with ISFSI operations to meet the above-mentioned dose limits.

This section provides the written evaluation required by 10 CFR 72.212(b)(5)(iii), demonstrating Duke Energy's compliance with the requirements of 10 CFR 72.104 for the MNS ISFSI.

6.2 Evaluation

This evaluation addresses the radiological dose rate from a composite population of all MNS ISFSI cask types.

6.2.1 §72.104(a) – Dose Limits

Duke Energy Engineering Instruction MCEI-0400-241 determined that the distance from the nearest residence to the ISFSI is 0.65 miles (1046 meters). Hence, it is conservative to assume that the closest real individual is at least 700 meters from the ISFSI.

Enercon determined the annual total dose (gamma plus neutron) at a distance of 700 meters from all currently loaded casks (10 TN-32A casks and 28 NAC-UMS® casks) to be approximately 1.62 mrem. The evaluation was based on actual cask average burn-up (as loaded) and considering cooling time on the storage

pads as of September 1, 2010. The distance at which this dose is calculated (700 meters) is conservative compared to the distance to the closest real individual.

NAC International determined the annual total dose (gamma plus neutron) at a distance of 700 meters from a (future) 2x6 array of MAGNASTOR® casks to be approximately 1.01 mrem (2.02 mrem for two arrays). The evaluation was conservatively based on full cask loads of 37 fuel assemblies at the maximum allowable heat load of 35.5 kW. The distance at which this dose is calculated (700 meters) is conservative compared to the distance to the closest real individual.

The total calculated annual public dose from liquid and gaseous effluent pathways averaged over a ten-year period is less than 1 mrem. No other uranium fuel cycle facility contributes significantly to the dose received by the closest real individual.

Based on the above, the calculated annual dose to the closest real individual due to the ISFSI, which is comprised of the currently existing ten TN-32A casks and 28 NAC-UMS® casks, and up to two 2x6 arrays of MAGNASTOR® casks (*see Note below*), is determined to be less than 4 mrem, and the estimated annual dose due to McGuire power generation is less than 1 mrem. Hence, the total annual dose to the closest real individual (less than 5 mrem) is within the 10 CFR 72.104(a) limit.

Note: As stated above, up to two 2x6 arrays of MAGNASTOR® *casks are assumed in this evaluation. The first eight MAGNASTOR® casks are planned to be placed on a concrete pad currently containing four NAC-UMS® casks. This will conservatively count as one 2x6 array. Additional MAGNASTOR® casks will be placed on their own concrete pad (the second 2x6 array). Hence, this §72.104(a) evaluation bounds up to 20 MAGNASTOR® casks, arranged as described.*

Attachment 7

Revisions to the Updated Final Safety Analysis Report Radiological Effluent Controls
Section 16.11

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.1 Liquid Effluents – Concentration

COMMITMENT The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (see Figure 16.11.1-1) shall be limited:

a. For radionuclides other than dissolved or entrained noble gases, 10 times the effluent concentrations specified in 10 CFR Part 20, Appendix B, Table 2, Column 2, and

b. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microCurie/ml total activity.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS not within limits.	A.1 Restore the concentration to within limits.	Immediately

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.1.1 ----------NOTE---------- 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. ---------- Sample and analyze radioactive liquid wastes according to Table 16.11.1-1.	According to Table 16.11.1-1

TABLE 16.11.1-1
(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) microCi/ml [1]
1. Batch Waste Release Tanks (WMT and RMT)[4]	P Each Batch	P Each Batch	Principal Gamma Emitters[6]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma emitters)[7]	$1x10^{-5}$
	P Each Batch	M Composite[2]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	P Each Batch	Q Composite[2]	Sr-89, Sr-90	$5x10^{-8}$
2. Continuous Releases (VUCDT discharge, CWWTS outlet and Turbine Building Sump to RC)[5]	Continuous[3]	W Composite[3]	Principal Gamma Emitters [6]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	M Grab Sample	M	Dissolved and Entrained Gases (Gamma emitters)[7]	$1x10^{-5}$
	Continuous[3]	M Composite[3]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Continuous[3]	Q Composite[3]	Sr-89, Sr-90	$5x10^{-8}$

TABLE 16.11.1-1
(Page 2 of 3)

NOTES:

(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 is the "a priori" lower limit of detection as defined above (as microCurie per unit mass or volume),

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

E is the counting efficiency (as counts per disintegration),

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

2.22 x 10^6 is the number of disintegrations per minute per microCurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

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.

(2) 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 which is representative of the liquids released.

TABLE 16.11.1-1
(Page 3 of 3)

(3) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously or intermittently 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.

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

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

(6) The principal gamma emitters for which the LLD specification applies exclusively are 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} microCi/ml. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall be identified and reported in the Annual Radioactive Effluent Release Report.

(7) The principal gas gamma emitters for which the LLD specification applies are Xe-133 and Xe-135. These are the reference nuclides in Regulatory Guide 1.21.

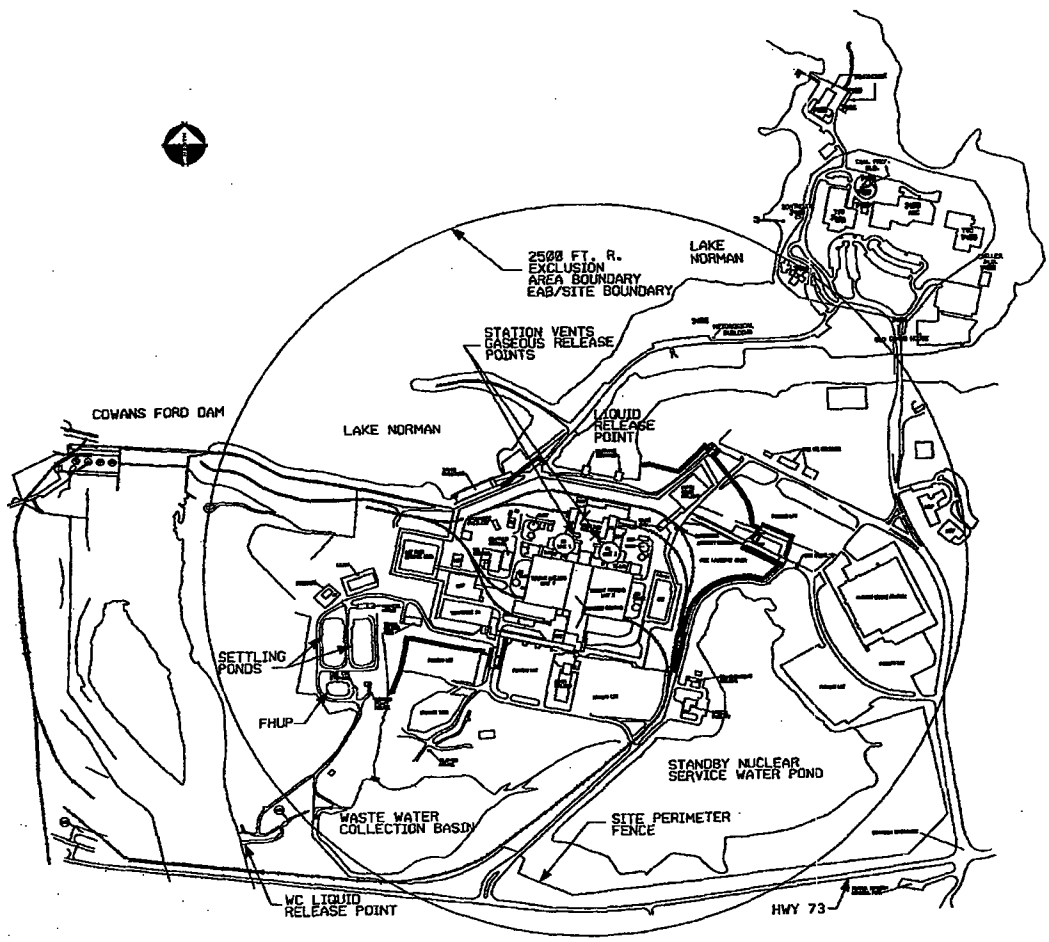

FIGURE 16.11.1-1 SITE BOUNDARY / EXCLUSION AREA BOUNDARY

BASES

This commitment is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS will be less than 10 times the effluent concentration levels specified in 10 CFR Part 20, Appendix B, Table 2, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will result in exposures within: (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC, and (2) the limits of 10 CFR Part 20.1301 to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its EC 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 liquid effluents from all reactors at the site.

The basic requirements for the Selected Licensee Commitments concerning effluents from nuclear power reactors are stated in 10CFR50.36a. 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 10CFR20.106 (new 10CFR20.1301). 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 10CFR20.106 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 10CFR50.36a 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 10CFR50, Appendix I.

As stated in the Introduction to Appendix B of the new 10CFR20, the 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 10CFR50, 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/McGuire/Oconee has demonstrated that the use of the concentration values associated with the old 10CFR20.106 as SLC limits has resulted in calculated maximum individual doses to members of the public that are small percentages of the limits of 10CFR50, Appendix I. Therefore, the use of concentration values which correspond to an annual dose of 500 mrem should not have a negative impact on the ability to continue to operate within the limits of 10CFR50 Appendix I and 40CFR190.

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 10CFR20, 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.

BASES (continued)

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 10CFR20, 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 10CFR20, Appendix B, Table II, Column 2 are based, is a factor of ten higher than the annual dose of 50 mrem, upon which the concentrations in the new 10CFR20, Appendix B, Table 2, Column 2, are based. Compliance with the limits of the new 10CFR20.1301 will be demonstrated by operating within the limits of 10CFR50, Appendix I and 40CFR190.

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," 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).

REFERENCES

1. McGuire Nuclear Station Offsite Dose Calculation Manual (ODCM)

2. International Commission on Radiological Protection (ICRP) Publication 2

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.2 Radioactive Liquid Effluent Monitoring Instrumentation

COMMITMENT

The radioactive liquid effluent monitoring instrumentation channels shown in Table 16.11.2-1 shall be FUNCTIONAL with their Alarm/Trip Setpoints set to ensure that the limits of SLC 16.11.1 are not exceeded.

AND

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

As shown in Table 16.11.2-1.

REMEDIAL ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more radioactive liquid effluent monitoring channels Alarm/Trip setpoint less conservative than required.	A.1 Suspend the release of radioactive liquid effluents monitored by the affected channel. OR A.2 Declare the channel non-functional. OR A.3 Adjust setpoint to within limit.	Immediately Immediately Immediately
B. One or more radioactive liquid effluent monitoring instrument channels non-functional.	B.1 Enter the Remedial Action specified in Table 16.11.2-1 for the channel(s).	Immediately

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One channel non-functional.	C.1.1 Analyze two independent samples per TR 16.11.1.1.	Prior to initiating a release
	AND	
	C.1.2 Perform independent verification of the discharge line valving.	Prior to initiating a release
	AND	
	C.1.3.1 Perform independent verification of manual portion of the computer input for the release rate calculations performed by computer.	Prior to initiating a release
	OR	
	C.1.3.2 Perform independent verification of entire release rate calculations for calculations performed manually.	Prior to initiating a release
	AND	
	C.1.4 Restore channel to FUNCTIONAL status.	14 days
	OR	
	C.2 Suspend the release of radioactive effluents via this pathway.	Immediately

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or more channels non-functional.	D.1 Obtain grab samples from the effluent pathway.	Once per 12 hours during releases.
	AND	
	D.2 Perform an analysis of grab samples for radioactivity.	To meet LLD requirements per Table 16.11.1-1.
	AND	
	D.3 Restore the channel to FUNCTIONAL status.	30 days
E. One or more flow rate measurement channels non-functional.	E.1 ----------NOTE---------- Pump performance curves generated in place may be used to estimate flow. ----------	
	Estimate the flow rate of the release.	Once per 4 hours during releases
	AND	
	E.2 Restore the channel to FUNCTIONAL status.	30 days
F. RC minimum flow interlock non-functional.	F.1 Verify that the number of pumps providing dilution is greater than or equal to the number of pumps required.	Once per 4 hours during releases
	AND	
	F.2 Restore the channel to FUNCTIONAL status.	30 days

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Required Action and associated Completion Time of Condition C, D, E or F not met.	G.1 Explain why the non-functionality was not corrected within the specified Completion Time in the Annual Radioactive Effluent Release Report.	In the next scheduled Annual Radioactive Effluent Release Report

TESTING REQUIREMENTS

----------NOTE----------

Refer to Table 16.11.2-1 to determine which TRs apply for each Radioactive Liquid Effluent Monitoring channel.

TEST	FREQUENCY
TR 16.11.2.1 Perform CHANNEL CHECK.	24 hours
TR 16.11.2.2 ----------NOTE---------- The CHANNEL CHECK shall consist of verifying indication of flow. ---------- Perform CHANNEL CHECK.	Every 24 hours during periods of release
TR 16.11.2.3 Perform SOURCE CHECK.	Prior to each release
TR 16.11.2.4 Perform SOURCE CHECK.	31 days
TR 16.11.2.5 ----------NOTES---------- 1. For Instrument 1, the COT shall also demonstrate that automatic isolation of the pathway occurs if the instrument indicates measured levels above the Alarm/Trip Setpoint. 2. For Instruments 1 and 2, the COT shall also demonstrate that control room alarm annunciation occurs if the instrument indicates measured levels above the Alarm/Trip Setpoint; circuit failure and, a downscale failure. ---------- Perform CHANNEL OPERATIONAL TEST.	92 days
TR 16.11.2.6 Perform a CHANNEL CALIBRATION.	18 months

(continued)

TESTING REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 16.11.2.7	----------NOTE---------- The initial CHANNEL CALIBRATION shall be performed using standards certified by the National Institute of Standards and Technology (NIST) or using standards obtained from suppliers that participate in measurement assurance activities with NIST. 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. ---------- Perform a CHANNEL CALIBRATION.	24 months

TABLE 16.11.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS FUNCTIONAL	REMEDIAL ACTION	APPLICABILITY	TESTING REQUIREMENTS
1. Radioactivity Monitors Providing Alarm And Automatic Termination of Release				
a. Waste Liquid Effluent Line (EMF-49)	1 per station	A, C, G	During liquid effluent releases	TR 16.11.2.1 TR 16.11.2.3 TR 16.11.2.5 TR 16.11.2.7
b. EMF-49 Minimum Flow Device (2)	1 per station	C, G	During liquid effluent releases	TR 16.11.2.5 TR 16.11.2.7
c. Containment Ventilation Unit Condensate Line (EMF-44)	1	A, D, G	At all times	TR 16.11.2.1 TR 16.11.2.4 TR 16.11.2.5 TR 16.11.2.7
d. EMF-44 Minimum Flow Device (2)	1	D, G	At all times	TR 16.11.2.5 TR 16.11.2.7
2. Radioactivity Monitors Providing Alarm But Not Automatic Termination of Release				
a. Conventional Waste Water Treatment Line or Turbine Building Sump to RC (EMF- 31)	1	A, D, G	At all times	TR 16.11.2.1 TR 16.11.2.4 TR 16.11.2.5 TR 16.11.2.7
b. EMF-31 Minimum Flow Device (2)	1	D, G	At all times	TR 16.11.2.5 TR 16.11.2.7
3. Continuous Composite Samplers				
a. Containment Ventilation Unit Condensate Line	1	D, G	At all times	TR 16.11.2.2 TR 16.11.2.5 TR 16.11.2.6
b. Conventional Waste Water Treatment Line	1 per station	D, G	At all times	TR 16.11.2.2 TR 16.11.2.5 TR 16.11.2.6
c. Turbine Building Sump to RC	1	D, G	At all times	TR 16.11.2.2 TR 16.11.2.6

(Continued)

4.	Flow Rate Measurement Devices				
	a. Waste Liquid Effluent Line	1 per station	E, G	During liquid effluent releases	TR 16.11.2.2 TR 16.11.2.5 TR 16.11.2.6
	b. Containment Ventilation Unit Condensate Line	1	E, G	At all times	TR 16.11.2.2 TR 16.11.2.5 TR 16.11.2.6
	c. Conventional Waste Water Treatment Line	1 per station	E, G	At all times	TR 16.11.2.2 TR 16.11.2.5 TR 16.11.2.6
	d. Turbine Building Sump to RC	1	E, G	At all times	TR 16.11.2.2 TR 16.11.2.6
5.	RC Minimum Flow Interlock (1)	1 per station	F, G	At all times	TR 16.11.2.5

NOTES:
1. Minimum flow dilution is assured by an interlock which terminates waste liquid release if the number of RC pumps running falls below the number of pumps required for dilution. The required number of RC pumps for dilution is determined per station procedures.

2. Radioactivity Monitor (EMF) shall not be declared functional unless both the EMF and the associated EMF's Minimum Flow Device are rendered functional.

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 minimum flow devices for EMFs listed in Table 16.11.2-1 are required to provide assurance of representative sampling during actual or potential releases of liquid effluents. An interlock between the EMF's minimum flow device and its associated flow rate measurement device disables the remove alarm during non-release timeframes for the purpose of the control room black board annunciator criteria that disable expected alarms. An EMF flow rate measurement device measures total flow of the effluent while the EMF minimum flow device measures the sample flow rate through the EMF. The Alarm/Trip Setpoints of 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 stated in SLC 16.11.1. The FUNCTIONALITY 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 Turbine Building Sump to RC Discharge Flow Measurement and Sampler Devices are for monitoring only and do not alarm or have any controls that require a COT.

REFERENCES

1. McGuire Nuclear Station Offsite Dose Calculation Manual (ODCM)

2. 10 CFR Part 50, Appendix A

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.3 Dose - Liquid Effluents

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 Figure16.11.1-1) shall be limited:

a. During any calendar quarter, to ≤ 1.5 mrem to the total body and to ≤ 5 mrem to any organ, and

b. During any calendar year, to ≤ 3 mrem to the total body and to ≤ 10 mrem to any organ.

APPLICABILITY At all times.

REMEDIAL ACTIONS

----------NOTES----------

Enter applicable Conditions and Required Actions of SLC 16.11.12, "Total Dose," when the limits of this SLC are exceeded by twice the specified limit.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Calculated dose from release of radioactive materials in liquid effluents exceeding above limits.	----------NOTE---------- The Special Report shall include the results of radiological analyses of the drinking water source, and the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act, as applicable. ---------- A.1 Prepare and submit a Special Report to the NRC which identifies the causes for exceeding the limits, corrective actions taken to reduce releases, and actions taken to ensure that subsequent releases are within limits.	30 days

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.3.1 Determine cumulative dose contributions from liquid effluents for current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

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 commitment 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. These requirements are applicable only if the drinking water supply is taken from the river 3 miles downstream of the plant discharge.

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 liquid effluents from each unit at the site. For units with shared Radwaste Treatment Systems, the liquid effluents from the shared system are to be proportioned among the units sharing that system in accordance with the guidance given in NUREG-0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 40 CFR Part 141, Safe Drinking Water Act

3. 10 CFR Part 50, Appendix I

4. 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.

5. Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.4 Liquid Radwaste Treatment System

COMMITMENT The Liquid Radwaste Treatment System shall be FUNCTIONAL 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 Figure16.11.1-1) would exceed 0.06 mrem to the total body or 0.2 mrem to any organ in a 31 day period.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	Radioactive liquid waste being discharged without treatment and in excess of above limits. AND Any portion of Liquid Radwaste Treatment System not in operation.	A.1	Prepare and submit a Special Report to the NRC which identifies the reasons liquid radwaste was discharged without treatment, identification of non-functional equipment and reasons for non-functionality, corrective actions taken to restore the equipment to FUNCTIONAL status, and actions taken to prevent recurrence.	30 days

TESTING REQUIREMENTS

----------NOTE----------

The Liquid Radwaste Treatment System shall be demonstrated FUNCTIONAL by meeting SLC 16.11.1 and16.11.3.

TEST		FREQUENCY
TR 16.11.4.1	Project liquid release doses from each unit to UNRESTRICTED AREAS, in accordance with the methodology and parameters in the ODCM, when water systems are being released without being processed by its radwaste treatment system.	31 days

BASES

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 specification 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 liquid effluents from each reactor at the site. For units with shared Radwaste Treatment Systems, the liquid effluents from the shared system are to be proportioned among the units sharing that system in accordance with the guidance given in NUREG-0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50

3. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT 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 (excluding tritium and dissolved or entrained noble gases):

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

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 ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Quantity of radioactive material in any of the chemical treatment ponds exceeding above limit.	A.1 Suspend all additions of radioactive material to the pond. AND	Immediately
	A.2 Initiate corrective action to reduce the pond contents to within limits.	Immediately

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.5.1 Verify quantity of radioactive material in each batch of slurry (powdex resin) to be transferred to chemical treatment ponds is within limits by analyzing a representative sample of the slurry. Each batch to be transferred to the chemical treatment ponds is limited by: $\sum_j \frac{Q_j}{(C_j \times 10)} < 6.0 \times 10^5 \frac{pCi/gm}{\mu Ci/ml}$	Prior to each transfer

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 SLC 16.11.5 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 4 to Appendix B of 10 CFR Part 20 applies.

The batch limits of slurry to the chemical treatment ponds assure that radioactive material in the slurry transferred to the CTP are "as low as is reasonably achievable" in accordance with 10 CFR Part 50.36a. The expression in SLC 16.11.5 assures no batch of slurry 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:

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

Where:

c_j = Radioactive 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.

BASES (continued)

For the design of filter/demineralizers using powder resin, the slurry wash volume and the weight of resin used per batch is fixed by the cell surface area, and the slurry volume to resin weight ratio is constant at 100 ml/gram of wet, drained resin with a moisture content of approximately 55 to 60% (bulk density of about 58 pounds per cubic feet). Therefore,

$$\sum_j \frac{c_j}{(C_j \, x 10)} = \sum_j \frac{Q_j}{(C_j \, x 10)(10^2 \, ml/gm)(10^6 \, pCi/\mu Ci)} < 0.006, \text{ and}$$

$$\sum_j \frac{Q_j}{(C_j \, x 10)} < 6.0 \, x 10^5 \, \frac{pCi/gm}{\mu Ci/ml}$$

Where:

Q_j = concentration of radioactive materials in wet, drained slurry (powdex 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 picoCuries/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); and

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

The batch limits provide assurance that activity input to the chemical treatment ponds will be minimized, and a means of identifying radioactive material in the inventory limitation of SLC 16.11.5.

The basic requirements for the Selected Licensee Commitments concerning effluents from nuclear power reactors are stated in 10CFR50.36a. 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 10CFR20.106 (new 10CFR20.1301). 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 10CFR20.106 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 10CFR50.36a 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 10CFR50, Appendix I.

BASES (continued)

As stated in the Introduction to Appendix B of the new 10CFR20, the 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 10CFR50, 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/McGuire/Oconee has demonstrated that the use of the concentration values associated with the old 10CFR20.106 as SLC limits has resulted in calculated maximum individual doses to members of the public that are small percentages of the limits of 10CFR50, Appendix I. Therefore, the use of concentration values which correspond to an annual dose of 500 mrem should not have a negative impact on the ability to continue to operate within the limits of 10CFR50, Appendix I and 40CFR190.

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 10CFR20, 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 10CFR20, 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 10CFR20, Appendix B, Table II, Column 2 are based, is a factor of ten higher than the annual dose of 50 mrem, upon which the concentrations in the new 10CFR20, Appendix B, Table 2, Column 2, are based. Compliance with the limits of the new 10CFR20.1301 will be demonstrated by operating within the limits of 10CFR50, Appendix I and 40CFR190.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR 20, Appendix B

3. 10 CFR 50, Appendix I, Section II.A

4. 10 CFR 20

5. 10 CFR 50.36a

16.11 RADIOLOGICAL EFFLUENT CONTROL

16.11.6 Dose Rate - Gaseous Effluents

COMMITMENT The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure16.11.1-1) shall be limited to the following:

a. For noble gases: $\leq$ 500 mrem/yr to the whole body and $\leq$ 3000 mrem/yr to the skin, and

b. For Iodine - 131 and 133, for tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days: $\leq$ 1500 mrem/yr to any organ.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Dose rate not within limit.	A.1 Restore the release rate to within limits.	Immediately

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.6.1 Verify dose rates due to noble gases in gaseous effluents are within limits in accordance with the methodology and parameters in the ODCM.	In accordance with the ODCM
TR 16.11.6.2 Verify dose rates due to radioactive materials, other than noble gases, in gaseous effluents are within limits in accordance with the methodology and parameters in the ODCM by obtaining representative samples and performing analyses in accordance with Table16.11.6-1.	In accordance with Table 16.11.6-1

TABLE 16.11.6-1
(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 Tanks	P Each Tank Grab Sample	P Each Tank	Principal Gas Gamma Emitters[6]	$1x10^{-4}$
2. Containment Purge	P Each PURGE Grab Sample	P Each PURGE	Principal Gas Gamma Emitters[6]	$1x10^{-4}$
		M	H-3	$1x10^{-6}$
3. Unit Vent	W[2] Grab Sample	W	Principal Gas Gamma Emitters[6]	$1x10^{-4}$
			H-3	$1x10^{-6}$
4.a. Radwaste Facility Vent b. Waste Handling Building c. Equipment Staging Building	W Grab Sample	W	Principal Gas Gamma Emitters[6]	$1x10^{-4}$
			H-3	$1x10^{-6}$
5. Unit Vents	Continuous[5]	W[8] Charcoal Sample	I-131	$1x10^{-12}$
			I-133	$1x10^{-10}$
	Continuous[5]	W[8] Particulate Sample	Principal Gamma Emitters[6] (I-131, Others)	$1x10^{-11}$
	Continuous[5]	M Composite Particulate Sample	Gross Alpha[7]	$1x10^{-11}$
	Continuous[5]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$

TABLE 16.11.6-1
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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. All Release Types as listed in 4 above.	Continuous[5]	W[8] Charcoal Sample	I-131	$1x10^{-12}$
			I-133	$1x10^{-10}$
	Continuous[5]	W[8] Particulate Sample	Principal Gamma Emitters[6] (I-131, Others)	$1x10^{-11}$
	Continuous[5]	M Composite Particulate Sample	Gross Alpha[7]	$1x10^{-11}$
	Continuous[5]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$

TABLE 16.11.6-1
(Page 3 of 4)

NOTES:

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 as defined above (as 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 (as counts per minute);

   E = the counting efficiency (as counts per disintegration);

   V = the sample size (in 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; and

   Δt = the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

   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 16.11.6-1
(Page 4 of 4)

NOTES:

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

3. Not used.

4. Not used.

5. 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.

6. The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe135, 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 $5x10^{-9}$ microCi/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 Annual Radioactive Effluent Release Report.

7. The composite filter(s) will be analyzed for alpha activity by analyzing the filter media used during the collection period.

8. Samples shall be changed at least once per 7 days and analyses shall be completed to meet LLD after changing, or after removal from sampler. If the particulate and charcoal sample frequency is changed to a 24 hour frequency the corresponding LLDs may be increased by a factor of 10 (i.e., LLD for I-131 from 1×10^{-12} to 1×10^{-11} microCi/ml).

BASES

Specific 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, and 3000 mrem/year to the skin from noble gases, and 1500 mrem/year to any organ from Iodine 131, Iodine 133, tritium, and all radionuclides in particulate form with half-lives greater than eight days. This commitment applies to the release of gaseous effluents from all reactors at the site. The Exclusion Area Boundary (Site Boundary) is set as the boundary for gaseous effluent release limits. The Exclusion Area Boundary (EAB) is formed by a 2500 ft radius centered on the Reactor Buildings' centerlines as shown on Figure 16.11.1-1.

The basic requirements for the Selected Licensee Commitments concerning effluents from nuclear power reactors are stated in 10CFR50.36a. 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 10CFR20.106 (new 10CFR20.1301). 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 10CFR20.106 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 10CFR50.36a 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 10CFR50, Appendix I.

As stated in the Introduction to Appendix B of the new 10CFR20, the effluent concentration (EC) limits given in Appendix B, Table 2, Column 1, are based on an annual dose of 50 mrem for isotopes for which inhalation or ingestion is limiting or 100 mrem for isotopes for which submersion (noble gases) is limiting. Since release concentrations corresponding to limiting dose rates of less than or equal to 500 mrem/year to the whole body, 3000 mrem/year to the skin from noble gases, and 1500 mrem/year to any organ from Iodine 131, Iodine 133, tritium and for 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 10CFR50, Appendix I and 40CFR190 are not likely to be exceeded, it should not be necessary to restrict the operational flexibility by incorporating the EC value for isotopes based on ingestion/inhalation (50 mrem/year) or for isotopes with the EC based on submersion (100 mrem/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 10CFR20, Appendix B, Table 2, Column 1, relate to a dose of 50 or 100 mrem in a year. When applied on an instantaneous basis, this corresponds to a dose rate of either 50 or 100 mrem/year. These low values are impractical upon which to base effluent monitor setpoint calculations for many 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 16.11.6 will be maintained at the current dose rate limit for noble gases of 500 mrem/year to the whole body and 3000 mrem/year to the skin, for Iodine 131, Iodine 133, tritium and all radionuclides in particulate form with half-lives greater than eight days an instantaneous dose rate limit of 1500 mrem/year to any organ.

BASES (continued)

Compliance with the limits of the new 10CFR20.1301 will be demonstrated by operating within the limits of 10CFR50, Appendix I and 40CFR190. Operational history at Catawba/McGuire/Oconee has demonstrated that the use of the dose rate values listed above (i.e. 500 mrem/year, 3000 mrem/year and 1500 mrem/year) as SLC limits has resulted in calculated maximum individual doses to members of the public that are small percentages of the limits of 10CFR50, Appendix I and 40CFR190.

The required detection capabilities for radioactive materials 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).

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 20, Appendix B

3. 10 CFR Part 20

4. 10 CFR Part 50

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.7 Radioactive Gaseous Effluent Monitoring Instrumentation

COMMITMENT

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 16.11.7-1 shall be FUNCTIONAL with Alarm/Trip Setpoints set to ensure that the limits of SLC 16.11.6 are not exceeded.

AND

The Alarm/Trip setpoints shall be determined and adjusted in accordance with the methodology and parameters in the ODCM.

---NOTE---
Brief periods of routine sampling (not to exceed 15 minutes) do not make the instrumentation non-functional.

APPLICABILITY

As shown in Table 16.11.7-1.

REMEDIAL ACTIONS

---NOTE---
Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more radioactive gaseous effluent monitoring channels Alarm/Trip setpoint less conservative than required.	A.1 Suspend the release of radioactive gaseous effluents monitored by the affected channel. OR A.2 Declare the channel non-functional. OR A.3 Adjust setpoint to within limit.	Immediately Immediately Immediately

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more radioactive gaseous effluent monitoring instrument channels non-functional.	B.1 Enter the Remedial Action specified in Table 16.11.7-1 for the channel(s).	Immediately
C. One channel non-functional.	C.1.1 Analyze two independent samples of the tank contents. AND	Prior to initiating a release
	C.1.2 Perform independent verification of the discharge valve lineup. AND	Prior to initiating a release
	C.1.3.1 Perform independent verification of manual portion of the computer input for the release rate calculations performed by computer. OR	Prior to initiating a release
	C.1.3.2 Perform independent verification of entire release rate calculations for calculations performed manually. AND	Prior to initiating a release
	C.1.4 Restore channel to FUNCTIONAL status. OR	14 days
	C.2 Suspend the release of radioactive effluents via this pathway.	Immediately

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or more flow rate measurement channels non-functional.	D.1 Estimate the flow rate of the release. AND D.2 Restore the channel to FUNCTIONAL status.	Once per 4 hours during releases 30 days
E. One or more noble gas activity monitor channels non-functional.	E.1 Obtain grab samples from the effluent pathway. AND E.2 Perform an analysis of grab samples for radioactivity. AND E.3 Restore the channel to FUNCTIONAL status.	Once per 12 hours during releases To meet LLD requirements per Table 16.11.6-1 30 days
F. Noble gas activity monitor providing automatic termination of release non-functional.	F.1 Suspend PURGING or VENTING of radioactive effluents via this pathway.	Immediately
G. One or more sampler channels non-functional.	G.1 Perform sampling with auxiliary sampling equipment as required by Table 16.11.6-1. AND G.2 Restore the channel to FUNCTIONAL status.	Continuously 30 days

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. One or more Sampler Minimum Flow Device Channels non-functional.	H.1 Verify flow through the sampling apparatus. AND H.2 Restore the channel to FUNCTIONAL status.	Once per 4 hours during releases 30 days
I. Required Action and associated Completion Time of Condition C, D, E, F, G, or H not met.	I.1 Explain why the non-functionality was not corrected within the specified Completion Time in the Annual Radioactive Effluent Release Report.	In the next scheduled Annual Radioactive Effluent Release Report

TESTING REQUIREMENTS

----------NOTE----------
Refer to Table 16.11.7-1 to determine which TRs apply for each Radioactive Gaseous Effluent Monitoring channel.

TEST	FREQUENCY
TR 16.11.7.1 Perform CHANNEL CHECK.	Prior to each release
TR 16.11.7.2 ----------NOTE---------- The SOURCE CHECK for these channels shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity or a simulated source of radioactivity such as a light emitting diode. --- Perform SOURCE CHECK.	Prior to each release
TR 16.11.7.3 Perform CHANNEL CHECK.	24 hours
TR 16.11.7.4 Perform CHANNEL CHECK.	7 days

(continued)

TESTING REQUIREMENTS (continued)

	TEST	FREQUENCY
TR 16.11.7.5	----------NOTE---------- The SOURCE CHECK for these channels shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity or a simulated source of radioactivity such as a light emitting diode. ---------- Perform SOURCE CHECK.	31 days
TR 16.11.7.6	----------NOTES---------- 1. For noble gas activity monitors providing automatic termination of release, the COT shall also demonstrate that automatic isolation of the pathway occurs if the instrument indicates measured levels above the Alarm/Trip Setpoint. 2. For all noble gas activity monitors, the COT shall also demonstrate that control room alarm annunciation occurs if the instrument indicates measured levels above the Alarm/Trip Setpoint; circuit failure and, a downscale failure. ---------- Perform CHANNEL OPERATIONAL TEST.	92 days
TR 16.11.7.7	----------NOTE---------- For all noble gas activity monitors, the initial CHANNEL CALIBRATION shall be performed using standards certified by the National Institute of Standards and Technology (NIST) or using standards obtained from suppliers that participate in measurement assurance activities with NIST. 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. ---------- Perform a CHANNEL CALIBRATION.	18 months

TABLE 16.11.7-1
(Page 1 of 3)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENTS	MINIMUM CHANNELS FUNCTIONAL	REMEDIAL ACTION	APPLICABILITY	TESTING REQUIREMENTS
1. WASTE GAS HOLDUP SYSTEM				
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release (Low Range- EMF-50 or 1EMF-36, low-range)	1 per station	A, C, I	During gas effluent releases.	TR 16.11.7.1 TR 16.11.7.2 TR 16.11.7.6 TR 16.11.7.7
b. Effluent System Flow Rate Measuring Device	1 per station	D, I	At all times except when isolation valve is closed & locked.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
2. Condenser Evacuation System - Noble Gas Activity Monitor (EMF-33)	1	A, E, I	When air ejectors are operable.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
3. Vent System				
a. Noble Gas Activity Monitor (Low Range - EMF-36)	1	A, E, I	At all times.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
b. Iodine Sampler	1	G, I	At all times, except during routine sampling.	TR 16.11.7.4
c. Particulate Sampler (EMF-35)	1	G, I	At all times, except during routine sampling.	TR 16.11.7.4
d. Unit Vent Flow Rate Monitor (Totalizer)	1	D, I	At all times.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
e. Iodine Sampler Minimum Flow Device	1	H,I	At all times, except during routine sampling.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
f. Particulate Sampler Minimum Flow Device (1)	1	G,I	At all times, except during routine sampling.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
4. Containment Purge System - Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release (Low Range - EMF-39)	1	A, F, I	Modes 1 through 6, except when isolation valve is closed & locked.	TR 16.11.7.2 TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7

(continued)

TABLE 16.11.7-1
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RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENTS	MINIMUM CHANNELS FUNCTIONAL	REMEDIAL ACTION	APPLICABILITY	TESTING REQUIREMENTS
5. Auxiliary Building Ventilation System - Noble Gas Activity Monitor (EMF-41 or EMF-36)	1	A, E, I	At all times.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
6. Fuel Storage Area Ventilation System - Noble Gas Activity Monitor (EMF-42 or EMF-36)	1	A, E, I	At all times.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
7. Contaminated Parts Warehouse Ventilation System				
a. Noble Gas Activity Monitor (EMF-53)	1 per station	A, E, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
b. Flow Rate Monitor	1 per station	D, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
c. EMF-53 Sampler Minimum Flow Device (1)	1 per station	H,I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
8. Radwaste Facility Ventilation System				
a. Noble Gas Activity Monitor (EMF-52)	1 per station	A, E, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
b. Flow Rate Monitor	1 per station	D, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
c. EMF-52 Sampler Minimum Flow Device (1)	1 per station	H, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7

(continued)

TABLE 16.11.7-1
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RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENTS	MINIMUM CHANNELS FUNCTIONAL	REMEDIAL ACTION	APPLICABILITY	TESTING REQUIREMENTS
9. Equipment Staging Building Ventilation System				
a. Noble Gas Activity Monitor (EMF-59)	1 per station	A, E, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7
b. Flow Rate Monitor	1 per station	D, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
c. EMF-59 Sampler Minimum Flow Device (1)	1 per station	H, I	During gaseous effluent releases.	TR 16.11.7.3 TR 16.11.7.6 TR 16.11.7.7
10. Containment Air Release and Addition System - Noble Gas Activity Monitor (EMF-39L or EMF-36L)	1	A, E, I	At all times except when isolation valve is closed & locked.	TR 16.11.7.3 TR 16.11.7.5 TR 16.11.7.6 TR 16.11.7.7

NOTES:

1. Radioactivity monitor (EMF) shall not be declared FUNCTIONAL unless both the EMF and the associated EMF's Minimum Flow Device are rendered FUNCTIONAL.

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 instrumentation consists of monitoring and sampling instrumentation. Monitors provide continuous display of process parameters with appropriate alarms and trip setpoints established. Samplers collect a portion of the desired process for subsequent laboratory analysis, and do not have alarm/trip capability. Samplers and the analysis program provide a method to assure that long term effluent release quantities do not exceed the requirements of SLC 16.11.6. Monitors provide assurance that instantaneous effluent releases do not exceed the requirements of SLC 16.11.6. The minimum flow devices for EMFs listed in Table 16.11.7-1 are required to provide assurance of representative sampling during actual or potential releases of gaseous effluents. The flow rate monitor quantifies the total gaseous effluent (both non-radioactive and radioactive) released to the environment. During routine sampling, instrumentation may be turned off for short periods of time (not to exceed 15 minutes) in order to meet analysis requirements of SLC 16.11.6. This is considered to be a normal function of the equipment. 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 stated in SLC 16.11.6. The FUNCTIONALITY 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.

REFERENCES

1. McGuire Nuclear Station, Offsite Dose Calculation Manual

2. 10 CFR Part 50, Appendix A

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.8 Noble Gases

COMMITMENT Air dose due to noble gases released in gaseous effluents, from each unit, to areas at and beyond the SITE BOUNDARY (see Figure16.11.1-1) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrad 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 ACTIONS

----------NOTES----------

Enter applicable Conditions and Required Actions of SLC 16.11.12, "Total Dose," when the limits of this SLC are exceeded by twice the specified limit.

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	Calculated air dose from radioactive noble gases in gaseous effluents exceeding any of above limits.	A.1	Prepare and submit a Special Report to the NRC which identifies the causes for exceeding the limits, corrective actions taken to reduce releases, and actions taken to ensure that subsequent releases are within limits.	30 days

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.8.1 Determine cumulative dose contributions from noble gases in gaseous effluents for current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

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 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 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 under-estimated.

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 at all times to the release of gaseous effluents from each reactor at the site. For units with shared Radwaste Treatment Systems, the gaseous effluents from the shared system are to be proportioned among the units sharing that system in accordance with the guidance given in NUREG-0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.9 Dose - Iodine-131 and 133, Tritium and Radioactive Materials in Particulate Form

COMMITMENT The dose to a MEMBER OF THE PUBLIC from Iodine-131 and 133, tritium, and all radioactive materials 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 16.11.1-1) 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 ACTIONS

----------NOTES----------
Enter applicable Conditions and Required Actions of SLC 16.11.12, "Total Dose," when the limits of this SLC are exceeded by twice the specified limit.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Calculated dose from the release of Iodine 131 and 133, tritium, and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits.	A.1 Prepare and submit a Special Report to the NRC which identifies the causes for exceeding the limits, corrective actions taken to reduce releases, and actions taken to ensure that subsequent releases are within limits.	30 days

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.9.1 Determine cumulative dose contributions for Iodine 131 and 133, tritium, and radioactive material in particulate form with half lives greater than 8 days in gaseous effluents for current calendar quarter and current calendar year in accordance with the methodology and parameters in the ODCM.	31 days

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. The Limiting Conditions for Operation 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 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 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 specifications for Iodine-131 and 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 these 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.

BASES (continued)

This commitment applies at all times to the release of gaseous effluents from each reactor at the site. For units with shared Radwaste Treatment Systems, the gaseous effluents from the shared system are to be proportioned among the units sharing that system in accordance with the guidance given in NUREG 0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.10 Gaseous Radwaste Treatment System

COMMITMENT

The VENTILATION EXHAUST TREATMENT and WASTE GAS HOLDUP SYSTEMS shall be FUNCTIONAL 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 16.11.1-1) would exceed:

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 ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Radioactive gases being discharged without treatment and in excess of above limits.	A.1 Prepare and submit a Special Report to the NRC which identifies non-functional equipment and reasons for non-functionality, actions taken to restore the equipment to FUNCTIONAL status, and actions taken to prevent recurrence.	30 days

TESTING REQUIREMENTS

----------NOTE----------

The installed Gaseous Radwaste Treatment System shall be demonstrated FUNCTIONAL by meeting SLC 16.11.6, 16.11.8 and16.11.9.

TEST	FREQUENCY
TR 16.11.10.1 Project gaseous release doses from each unit to areas at and beyond the SITE BOUNDARY, in accordance with the methodology and parameters in the ODCM, when gaseous systems are being released without being processed by its radwaste treatment system.	31 days

BASES

The FUNCTIONALITY 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 19 CFR Part 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 Section II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

This commitment applies at all times to the release of radioactive materials in gaseous effluents from each unit at the site. For units with shared Radwaste Treatment Systems, the gaseous effluents from the shared system are to be proportioned among the units sharing that system in accordance with NUREG-0133, Chapter 3.1.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

3. 10 CFR Part 50

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.11 Solid Radioactive Waste

COMMITMENT

Radioactive wastes shall be processed and packaged to ensure compliance with the applicable requirements of 10 CFR Part 20, 10CFR Part 61, 10 CFR Part 71, and State regulations governing the transportation and disposal of radioactive wastes.

The Solid Radwaste System or an approved alternative process shall be used in accordance with a PROCESS CONTROL PROGRAM (PCP) for the solidification of liquid or wet radioactive wastes or the dewatering of wet radioactive wastes to be shipped for direct disposal at a 10CFR61 licensed disposal site. Wastes shipped for off site processing in accordance with the processor's specifications and transportation requirements are not required to be solidified or dewatered to meet disposal requirements.

- The PCP describes administrative and operational controls used for the solidification of liquid or wet solid radioactive wastes in order to meet applicable 10CFR61 waste form requirements.
- The PCP describes the administrative and operational controls used for the dewatering of wet radioactive wastes to meet 10CFR61 free standing water requirements.
- The process parameters used in establishing the PCP shall be based on demonstrated processing of actual or simulated liquid or wet solid wastes and must adequately verify that the final product of solidification or dewatering meets all applicable Federal, State and disposal site requirements.

APPLICABILITY

At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Applicable regulatory requirements for solidified or dewatered wastes are not satisified.	A.1 Suspend shipments of defectively packaged solid radioactive wastes from the site. AND	Immediately
	A.2 Initiate action to correct the PROCESS CONTROL PROGRAM, procedures, or solid waste equipment as necessary to prevent recurrence.	Prior to next shipment for disposal of solidified or dewatered wastes.
B. A solidification test as described in the PCP fails to verify Solidification.	B.1 Suspend solidification of the batch under test and follow PCP guidance for test failures.	Immediately
	B.2 Once a subsequent test verifies Solidification, solidification of the batch may then be resumed as directed by the PCP. The PCP shall be modified as required to assure Solidification of subsequent batches of waste	Prior to next solidification for shipment of waste for disposal at a 10CFR61 disposal site.

(continued)

REMEDIAL ACTIONS (continued)

C.	With solidification or dewatering for disposal not performed in accordance with the PROCESS CONTROL PROGRAM.	C.1	Reprocess the waste in accordance with PCP requirements. OR	Prior to shipment for disposal of the inadequately processed waste that requires solidification of dewatering
		C.2	Follow PCP or procedure quidance for alternative free standing liquid verification to ensure the waste in each container meets disposal requirements and take appropriate administrative action to prevent recurrence.	
D.	With the solid waste equipment incapable of meeting SLC 16.11.11 or not in service	D.1	Restore the equipment to FUNCTIONAL status or provide for alternative capability to process wastes as necessary to satisfy all applicable disposal requirements	In a time frame that supports the COMMITMENT section of SLC 16.11.11

TESTING REQUIREMENTS

TEST		FREQUENCY
TR 16.11.11.1	The Process Control Program shall be used to verify the Solidification of at least one representative test specimens from at least every tenth batch of each type of radioactive waste to be solidified for disposal at a 10CFR61 disposal site per the COMMITMENT of this SLC.	Every tenth batch of each type of radioactive waste to be solidified.

BASES:

This commitment implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and requirements to use a Process Control Program to meet applicable 10CFR61 waste form criteria for solidified and dewatered radioactive wastes.

REFERENCES:

1. 10CFR Part 50, "Domistic Licensing of Production and Utilization Facilities"
2. 10 CFR Part 50, Appendix A
3. 10CFR20, "Standards for Protection Against Radiation"
4. 10CFR61, "Licensing Requirements for Land Disposal of Radioactive Waste
5. 10CFR71, "Packaging and Transportation of Radioactive Materials"
6. DPCo Process Control Program Manual
7. NRC Generic Letter 84-12, "Compliance With 10 CFR Part 61 And Implementation Of the Radiological Effulent Technical Specifications (Rets) and Attendant Process Control Program (PCP)"
8. NRC Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effulent Technical Specifications In the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of Rets to the Offsite Dose Calculation Manual or to the Process Control Program"

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 radiation, from uranium fuel cycle sources shall be limited to $\leq$ 25 mrem to the whole body or any organ, except the thyroid, which shall be limited to $\leq$ 75 mrem.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Calculated doses from releases exceeding twice the specified limits of SLC 16.11.3, 16.11.8 or 16.11.9.	A.1 Verify, by calculation, the cumulative dose from direct radiation contributions, the ISFSI, outside storage tanks, and radioactivity releases are within the total dose limit.	Immediately
	AND	
	A.2 ----------NOTE---------- Only required to be performed if the total dose limit is exceeded. ---------- Prepare and submit a Special Report to the NRC which identifies corrective actions to be taken to reduce subsequent releases to prevent recurrence and schedule for achieving conformance with specified limits.	30 days

TESTING REQUIREMENTS

----------NOTE----------

Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with SLC 16.11.3, 16.11.8 and16.11.9, and in accordance with the methodology and parameters specified in the ODCM.

TEST	FREQUENCY
TR 16.11.12.1 Determine cumulative dose contributions from direct radiation from the units, the ISFSI, and from radwaste storage tanks in accordance with the methodology and parameters specified in the ODCM.	When calculated doses from effluent releases exceeds twice the limits of SLCs 16.11.3, 16.11.8 or 16.11.9

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 specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation 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 10 CFR Part 50, Appendix I, and if direct radiation doses from the units and outside storage tanks are kept small.

This Special Report, as defined in 10 CFR Part 20.2203(a)(4), 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. 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

BASES (continued)

accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.2203(a)(4), is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 and a variance is granted 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 SLCs 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.

REFERENCES

1. McGuire Nuclear Station, Offsite Dose Calculation Manual

2. 10 CFR Part 20

3. 40 CFR Part 190

4. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT MONITORING

16.11.13 Radiological Environmental Monitoring Program

COMMITMENT The Radiological Environmental Monitoring Program shall be conducted as specified in Table 16.11.13-1.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	Radiological Environmental Monitoring Program not being conducted as specified in Table 16.11.13-1.	A.1	Identify the reasons for not conducting the program as required and the plans for preventing a recurrence in the Annual Radiological Environmental Operating Report.	Within the next scheduled Annual Radiological Environmental Operating Report
B.	Radioactivity level of environmental sampling medium at a specified location in excess of reporting limits of Table 16.11.13-2.	B.1	Prepare and submit a Special Report that 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.	30 days

(continued)

REMEDIAL ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Milk or fresh leafy vegetable samples unavailable from one or more required sample locations.	C.1 ----------NOTE---------- Specific locations from which samples were unavailable may be deleted from the program. ---------- Revise the Radiological Environmental Monitoring Program to identify locations for obtaining replacement samples.	30 days
	AND	
	C.2 Identify the cause of the unavailability of samples and identify new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).	Within the next scheduled Annual Radioactive Effluent Release Report

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.13.1 ----------NOTES---------- The maximum values for the lower limits of detection shall be as specified in Table16.11.13-3. ---------- The radiological environmental monitoring samples shall be collected from the locations given in the table and figure in the ODCM and shall be analyzed pursuant to the requirements of Tables16.11.13-1.	In accordance with Table 16.11.13-1

TABLE 16.11.13-1
(Page 1 of 6)
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 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.

(continued)

TABLE 16.11.13-1
(Page 2 of 6)

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. One sample from a control location, as for example 15-30 km distant and in the least prevalent wind direction[3].	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[4]; Gamma isotopic analysis[5] of composite (by location quarterly).
3. Waterborne a. Surface[6]	One sample upstream. One sample downstream.	Composite sample over 1-month period[7].	Gamma isotope analysis[5] monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from one or two sources only if likely to be affected[8]	Quarterly	Gamma isotopic[5] and tritium analysis quarterly.

(continued)

TABLE 16.11.13-1
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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
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[7] 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[9]. Composite for gross beta and gamma isotopic analyses[5] monthly. Composite for tritium analysis quarterly.
d. Sediment from the shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually	Gamma isotopic analysis[5] semiannually.
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[9]. 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[5] and I-131 analysis semimonthly when animals are on pasture; monthly at other times.

(continued)

TABLE 16.11.13-1
(Page 4 of 6)

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
b. Fish and Invertebrates	One sample each commercially and recreationally important species in vicinity of plant discharge area. One sample of same species in areas not influenced by plant discharge.	Sample in season, or semiannually if they are not seasonal	Gamma isotopic analysis[5] on edible portions
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[10]	Gamma isotopic analyses[5] 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[5] 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[5] and I-131 analysis.

TABLE 16.11.13-1

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

NOTES:

1. Specific parameters of distance and direction sector from the centerline of one reactor, and additional description where pertinent, shall be provided for each and every sample location in Table 16.11.13-1 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 hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every 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. It is recognized that, at times, it may not be possible or practical 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 an Licensee Event Report, identify the cause of the unavailability of samples for that pathway and identify the new locations(s) for obtaining replacement samples in the next Annual 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 forty 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 sections 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 with minimal fading.

3. The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.

4. 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 ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

TABLE 16.11.13-1

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

NOTES (continued):

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

6. 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.

7. A composite sample is one in which the quantity (aliquot) of liquid sampled is proportional to the quantity of flowing liquid and in which the method of sampling employed results in a specimen that is representative of the liquid flow. 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.

8. 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.

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

10. 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 tuborous and root food products.

TABLE 16.11.13-2
(Page 1 of 1)

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)	BROAD LEAF VEGETATION (pCi/kg, wet)
H-3	20,000[1]	N/A	N/A	N/A	N/A
Mn-54	1,000	N/A	30,000	N/A	N/A
Fe-59	400	N/A	10,000	N/A	N/A
Co-58	1,000	N/A	30,000	N/A	N/A
Co-60	300	N/A	10,000	N/A	N/A
Zn-65	300	N/A	20,000	N/A	N/A
Zr-Nb-95	400	N/A	N/A	N/A	N/A
I-131	2	0.9	N/A	3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200	N/A	N/A	300	N/A

NOTES:

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.

TABLE 16.11.13-3
(Page 1 of 3)

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD) [1][2][3]

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

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

TABLE 16.11.13-3
(Page 2 of 3)

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)

NOTES:

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 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 is the "a priori" lower limit of detection as defined above (as picoCurie per unit mass or volume),

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

   E is the counting efficiency (as counts per disintegration),

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

   2.22 is the number of disintegrations per minute per picoCurie,

   Y is the fractional radiochemical yield (when applicable),

   λ is the radioactive decay constant for the particular radionuclide, and

   Δt is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluent samples).

   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.

TABLE 16.11.13-3
(Page 3 of 3)

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)

NOTES (continued):

2. 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.

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

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

BASES

The Radiological Environmental Monitoring Program is established to monitor the radiation and radionuclides in the environs of the plant. The program provides representative measurements of radioactivity in the highest potential exposure pathways, and verification of the accuracy of the effluent monitoring program and modeling of environmental exposure pathways. The program is contained in SLC 16.11.13 – 16.11.16 and conforms to the guidance of Appendix I to 10 CFR Part 50. The program includes the following:

1. Monitoring, sampling, analysis, and reporting of radiation and radionuclides in the environment in accordance with the methodology and parameters in the ODCM,

2. A Land Use Census to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the monitoring program are made if required by the results of this census, and

3. Participation in an Interlaboratory Comparison Program to ensure that independent checks on the precision and accuracy of the measurements of radioactive materials in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring.

The portion of 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 station 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 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 16.11.13-3 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.

With the level of radioactivity in an environmental sampling medium at a specified location exceeding the reporting levels of Table 16.11.13-3 when averaged over any calendar quarter, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days a Special Report that defines the corrective actions to be

BASES (continued)

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 SLCs 16.11.6, 16.11.8, and 16.11.9. When more than one of the radionuclides in Table 16.11.13-2 are detected in the sampling medium, this report shall be submitted if:

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

When radionuclides other than those in Table 16.11.13-2 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 is equal to or greater than the calendar year limits of SLCs 16.11.6, 16.11.8 and 16.11.9. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report. The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

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).

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

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:

a. the nearest milk animal,

b. the nearest residence, and

c. the nearest garden of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

For elevated releases as defined in Regulatory Guide 1.111, Revision 1, July 1977, the land use census shall identify within a distance of 5 km (3 miles) the location in each of the 16 meteorological sectors of:

a. all milk animals, and

b. all gardens of greater than 50 m^2 producing broad leaf vegetation.

----------NOTE----------
Broad leaf vegetation sampling of 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. Specifications for broad leaf vegetation sampling in Table 16.11.13-1 4c shall be followed, including analysis of control samples.

APPLICABILITY

At all times.

REMEDIAL ACTIONS

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	Location(s) identified which yields a calculated dose/dose commitment greater than values currently calculated in SLC 16.11.9.	A.1	Identify the new location in the Annual Radioactive Effluent Release Report.	In next scheduled Annual Radioactive Effluent Release Report

(continued)

REMEDIAL ACTIONS (continued)

B.	Location(s) identified which yields a calculated dose or dose commitment (via same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with SLC 16.11.13.	B.1	Add the new location to the Radiological Environmental Monitoring Program.	30 days
		AND		
		B.2	----------NOTES---------- If samples cannot be obtained, an explanation of why samples are not obtainable (substitute representative locations if possible) shall be included. ----------	
			Identify the new location(s), revised figures and tables for the ODCM, in the next Annual Radiological Release Report.	In the next scheduled Annual Radiological Release Report

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.14.1 ----------NOTE---------- The results of the land use census shall be included in the Annual Radiological Environmental Operating Report. ---------- Conduct a land use census during the growing season using the information which will provide the best results such as a door-to-door survey, aerial survey, or consultation with local agricultural authorities.	12 months

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 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 quantity (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.

With a land use census identifying a location(s) which 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 to the Radiological Environmental Monitoring Program. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment (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.

REFERENCES

1. McGuire Nuclear Station, Off site Dose Calculation Manual

2. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.15 Interlaboratory Comparison Program

COMMITMENT Analyses shall be performed on radioactive materials, supplied as part of an Interlaboratory Comparison Program (ICP), that correspond to samples required by SLC 16.11.13.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Analyses not being performed as required.	A.1 Report corrective actions taken to prevent recurrence in the Annual Radiological Environmental Operating Report.	In next scheduled Annual Radiological Environmental Operating Report

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.15.1 Report a summary of the results of the Interlaboratory Comparison Program in the Annual Radiological Environmental Operating Report.	12 months

BASES

This requirement for participation in an 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.

The Interlaboratory Comparison Program (ICP) shall be described in the Annual Radiological Environmental Operating Report.

REFERENCES

1. 10 CFR Part 50, Appendix I

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.16 Annual Radiological Environmental Operating Report

COMMITMENT

Routine Annual Radiological Environmental Operating Reports covering the operation of the unit during the previous calendar year shall be submitted by 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 pre-operational 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 land use censuses required by SLC 16.11.14.

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 (one map shall cover stations near the site boundary; a second shall include the more distant stations);
- the results of licensee participation in the Interlaboratory Comparison Program, required by SLC 16.11.15;
- a discussion of all deviations from the sampling schedule of Table 16.11.13-1; and

COMMITMENT (continued)

- a discussion of all analyses in which the LLD required by Table 16.11.13-3 was not achievable.

A single submittal may be made for a multiple unit station..

APPLICABILITY

At all times.

REMEDIAL ACTIONS

None

TESTING REQUIREMENTS

None

BASES

None

REFERENCES

1. Technical Specification 5.6.2

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.17 Radioactive Effluent Release Reports

COMMITMENT

Routine Radioactive Effluent Release Reports covering the operation of the unit during the previous calendar year of operation 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 as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Radioactive Effluent Release Report shall include an annual summary of hourly meteorological data collected over the previous calendar 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. 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. A five year average of representative onsite meteorological data shall be used in the gaseous effluent dose pathway calculations. Dispersion factors (X/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 (continued)

The Radioactive Effluent Release Reports shall include the following information for each type of solid waste shipped offsite or disposed of in the site landfill 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.

The Radioactive Effluent Release Reports shall also identify any licensee initiated major changes to the Radioactive Waste Systems (liquid, gaseous, and solid). Otherwise, this information may be included in the annual UFSAR update. The discussion of each change shall contain:

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

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

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

d. 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;

COMMITMENT (continued)

e. An evaluation of the change, which shows expected maximum exposures to individual in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the License application and amendments thereto;

f. 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;

g. An estimate of the exposure to plant operating personnel as a result of the change; and

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

A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate Radwaste Systems, the submittal shall specify the releases of radioactive material from each unit.

APPLICABILITY

At all times

REMEDIAL ACTIONS

None

TESTING REQUIREMENTS

None

BASES

None

REFERENCES

1. Technical Specification 5.6.3

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.18 Liquid Holdup Tanks

COMMITMENT The quantity of radioactive material contained in each unprotected outdoor radwaste tank shall be limited to ≤ 10 Curies, excluding tritium and dissolved or entrained noble gases.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Quantity of radioactive material in tank not within limit.	A.1 Suspend all additions of radioactive material to the tank.	Immediately
	AND	
	A.2 Reduce the tank contents to within limit.	48 hours
	AND	
	A.3 Describe the events leading to this condition in the next Annual Radioactive Effluent Release Report.	Within the next scheduled Annual Radioactive Effluent Release Report

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.18.1 Verify the quantity of radioactive material contained in unprotected outdoor radwaste tanks is within limits by analyzing a representative sample of the tank's contents when radioactive materials are being added to the tank.	7 days

BASES

The tanks applicable to this SLC include all those outdoor radwaste tanks that are not surrounded by liners, dikes, or walls capable of holding the tank contents and 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 tanks' 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.

REFERENCES

None

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.19 Explosive Gas Mixture

COMMITMENT The concentration of oxygen in the WASTE GAS HOLDUP SYSTEM shall be limited to ≤ 2% by volume whenever the hydrogen concentration exceeds 4% by volume.

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	Concentration of oxygen in the WASTE GAS HOLDUP SYSTEM > 2% but ≤ 4% by volume.	A.1	Reduce oxygen concentration to within limits.	48 hours
B.	Concentration of oxygen in the WASTE GAS HOLDUP SYSTEM > 4% and hydrogen concentration > 4% by volume.	B.1	Suspend all additions of waste gases to the system.	Immediately
		AND		
		B.2	Reduce the concentration of oxygen to ≤ 4% by volume.	Immediately
		AND		
		B.3	Reduce oxygen concentration to within limits.	48 hours

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.19.1 Verify the concentrations of hydrogen and oxygen in the WASTE GAS HOLDUP SYSTEM is within limits by monitoring waste gases in the WASTE GAS HOLDUP SYSTEM with the hydrogen and oxygen monitors required by SLC 16.7.8.	During WASTE GAS HOLDUP SYSTEM operation

BASES

This specification 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.

REFERENCES

None

16.11 RADIOLOGICAL EFFLUENT CONTROLS

16.11.20 Gas Storage Tanks

COMMITMENT The quantity of radioactivity contained in each gas storage tank shall be limited ≤ 49,000 Curies noble gases (considered as Xe-133).

APPLICABILITY At all times.

REMEDIAL ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Quantity of radioactive material in tank not within limit.	A.1 Suspend all additions of radioactive material to the tank. AND A.2 Reduce the tank contents to within limit.	Immediately 48 hours

TESTING REQUIREMENTS

TEST	FREQUENCY
TR 16.11.20.1 Verify the quantity of radioactive material contained in each gas storage tank is within limit when radioactive materials are being added to the tank.	24 hours

BASES

This SLC considers postulated radioactive releases due to a waste gas system leak or failure, and limits the quantity of radioactivity in each pressurized gas storage tank in the WASTE GAS HOLDUP SYSTEM to assure that a release would be substantially below the dose guideline values of 10 CFR Part 100 for a postulated event.

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 resulting total body exposure to a MEMBER OF THE PUBLIC at the nearest exclusion area 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.

REFERENCES

None

Attachment 8

Revisions to the Radioactive Waste Process Control Program Manual
(CD-Rom)

Attachment 9

Information to Support the Nuclear Energy Institute (NEI) Groundwater Protection Initiative

2012 McGuire ARERR Groundwater Well Data Section

Duke Energy implemented a Groundwater Protection Program in 2007. This program was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to ground water. As part of this program, McGuire Nuclear Station monitored sixty ground water wells during 2012.

Wells are sampled quarterly, semi-annually or annually. Ground water samples are regularly analyzed for tritium and gamma emitters, with selected wells being analyzed for difficult to detect radionuclides. No gamma or difficult to detect radionuclides (other than naturally occurring radionuclides) were identified in well samples during 2012. Results from sampling during 2012 confirmed existing knowledge of tritium concentrations in site ground water (shown in the table below). Lining of the Conventional Waste Ponds was performed in 2011 and 2012. Wells closest to these ponds have shown a decrease in tritium concentration.

Results from sampling during 2012 are shown in the table below.

Well Name	Location	Tritium Concentration (pCi/l)				# of Samples
		2/12/12	5/22/12	8/20/12	11/12/12	
M-20	South of Hwg. 73		539		679	2
M-20R	South of Hwg. 73		495		632	2
M-21	South of Hwg. 73		<MDA		193	2
M-22	South of Hwg. 73		<MDA		<MDA	2
M-22R	South of Hwg. 73		<MDA		<MDA	2
M-23	South of Acs. Rd.		<MDA		<MDA	2
M-30	WWCB		215		<MDA	2
M-30R	WWCB		367		246	2
M-31	Access road		<MDA		<MDA	2
M-32	Main entrance		187		<MDA	2
M-34R	Access road	<MDA	<MDA	<MDA	<MDA	4
M-34DR	Access road	<MDA	<MDA	<MDA	<MDA	4
M-35	Access road	<MDA	<MDA	<MDA	<MDA	4
M-42	U-2 Rx. Bldg.	2,420	1,600	1,670	1,750	4
M-48	U-2 SFP	NS	NS	NS	NS	0
M-48R	U-2 SFP	771	647	677	684	4
M-48DR	U-2 SFP	NS	NS	216	232	2
M-53	North of plant	897	928	999	835	4
M-55	North Admin. Bldg.	275	303	228	<MDA	4
M-59	U-2 Doghouse	2,210	2,000	2,330	2,080	4
M-60	MOC Parking		<MDA		<MDA	2
M-62	S of RWF	<MDA	161	<MDA	156	4
M-64	Rdwst. Bldg.	604	570	536	551	4
M-66	S of SSF	539	724	754	727	4
M-66R	S of SSF	<MDA	<MDA	<MDA	<MDA	4
M-68	U-1 RMWST	648	502	555	555	4
M-70	U-1 SFP	474	404	517	464	4
M-70R	U-1 SFP	287	<MDA	<MDA	202	4

2012 McGuire ARERR Groundwater Well Data Section

Well Name	Location	Tritium Concentration (pCi/l) 2/12/12	5/22/12	8/20/12	11/12/12	# of Samples
M-70DR	U-1 SFP	<MDA	<MDA	<MDA	<MDA	4
M-72	Rdwst. Trench	1,000	783	903	785	4
M-76	West of U-1 SFP	479	303	409	386	4
M-82	River	2,180	1,640	1,620	1,630	4
M-84	River	4,520	4,230	5,710	6,340	4
M-84R	River	7,600	6,950	6,790	6,510	4
M-85	River	1,560	1,400	1,500	1,350	4
M-87	Landfarm	825	708	577	669	4
M-89	Landfarm	646	707	582	482	4
M-90	Landfarm		485		482	2
M-91	East of WC	388	504	465	406	4
M-91R	East of WC	378	393	409	240	4
M-92	N of WC Ponds		400		333	2
M-92R	N of WC Ponds		<MDA		<MDA	2
M-93	North of IHUP		715		775	2
M-93R	North of IHUP		270		191	2
M-94	SE of IHUP		<MDA		<MDA	2
M-95	Lower Parking		<MDA		<MDA	2
M-95R	Lower Parking		<MDA		<MDA	2
M-96	West Parking		<MDA		<MDA	2
M-96R	West Parking		<MDA		<MDA	2
M-97	East Parking		243		182	2
M-98	S of Admin. Bldg.		<MDA		<MDA	2
M-98R	S of Admin. Bldg.		<MDA		<MDA	2
M-100R	SE of WC	306	324	197	<MDA	4
M-101	SE of WC	273	230	268	202	4
M-102	SW of WC	7,280	6,500	6,210	5,860	4
M-103	South of WC	2,230	2,310	2,450	2,070	4
M-103R	South of WC	2,050	2,330	1,890	1,870	4
M-104R	West of WC	3,340	2,390	2,280	1,880	4
M-104DR	West of WC	3,680	3,140	2,980	2,750	4
M-105	Landfarm		225		<MDA	2

2012 McGuire ARERR Groundwater Well Data Section

Well Name	Location	Tritium Concentration (pCi/l) 1/6/12	7/16/12	# of Samples
MW-1	Landfill #1	<MDA	<MDA	2
MW-1D	Landfill #1	<MDA	<MDA	2
MW-2A	Landfill #1	<MDA	<MDA	2
MW-2D	Landfill #1	<MDA	<MDA	2
MW-3	Landfill #1	<MDA	<MDA	2
MW-3D	Landfill #1	<MDA	<MDA	2
MW-4	Landfill #1	<MDA	<MDA	2
MW-4D	Landfill #1	<MDA	<MDA	2
MW-11	Landfill #1	<MDA	<MDA	2
MW-11D	Landfill #1	<MDA	<MDA	2
MW-12	Landfill #1	<MDA	<MDA	2
MW-12D	Landfill #1	<MDA	<MDA	2

Well Name	Location	Tritium Concentration (pCi/l) 6/20/12	12/4/12	# of Samples
MW-5	Landfill #2	NS	NS	0
MW-5A	Landfill #2	<MDA	<MDA	2
MW-6	Landfill #2	<MDA	<MDA	2
MW-6A	Landfill #2	<MDA	<MDA	2
MW-7	Landfill #2	NS	NS	0
MW-7A	Landfill #2	<MDA	<MDA	2
MW-8	Landfill #2	<MDA	<MDA	2
MW-8A	Landfill #2	<MDA	<MDA	2
MW-10A	Landfill #2	<MDA	NS	1

Well Name	Location	Tritium Concentration (pCi/l) 6/20/12	8/20/12	9/10/12	10/16/12	11/13/12	12/4/12	# of Samples
MW-9	Landfill #2	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	6
MW-9A	Landfill #2	<MDA	<MDA	<MDA	<MDA	<MDA	<MDA	6

NS - Not sampled due to insufficient volume in well.

pCi/l - pico curies per liter

<MDA - less than minimum detectable activity, typically 250 pCi/liter

20,000 pCi/l - the Environmental Protection Agency drinking water standard for tritium. This standard applies only to water that is used for drinking.

1,000,000 pCi/l - the 10CFR20, Appendix B, Table 2, Column 2, Effluent Concentration limit for tritium.

Attachment 10

Inoperable Monitoring Equipment

McGuire Nuclear Station

ATTACHMENT 10

Inoperable Equipment

(January 1, 2012 through December 31, 2012)

There were no SLC related effluent monitoring instruments out of service greater than the SLC limits for functionality.

Attachment 11

Radioactive Waste Systems Changes

ATTACHMENT 11

Radioactive Waste Systems Changes

This attachment documents the changes made to the radioactive waste systems at the McGuire Nuclear Station during the period January 1, 2012 to December 31, 2012.

There were no changes made to the radioactive waste systems during 2012 at the McGuire Nuclear Station.