Enclosure (1)

2010 Annual Radioactive Effluent Release Report including Revision 26 of the Offsite Dose Calculation Manual

2010

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

TABLE OF CONTENTS

1.0	**Introduction**	**1**
2.0	**Supplemental Information**	**1**
2.1	Regulatory Limits	1
2.2	Effluent Concentration Limits	3
2.3	Release Rate Limits	3
2.4	Measurements and Approximations of Total Radioactivity	3
2.5	Batch Releases	4
2.6	Abnormal Releases	4
3.0	**Summary of Gaseous Radioactive Effluents**	**5**
4.0	**Summary of Liquid Radioactive Effluents**	**5**
5.0	**Solid Waste**	**5**
6.0	**Lower Limit of Detection**	**6**
7.0	**Radiological Impact**	**6**
8.0	**Meteorological Data**	**7**
9.0	**Land Use Census Changes**	**7**
10.0	**Changes to the Offsite Dose Calculation Manual**	**7**
11.0	**Changes to the Process Control Program**	**8**
12.0	**Major Changes to Radwaste Treatment Systems**	**8**
13.0	**Inoperable Monitors**	**9**
14.0	**Changes to Previous Annual Effluent Reports**	**9**
15.0	**Groundwater Monitoring**	**9**

LIST OF TABLES

Table 1A Gaseous Effluents - Summation of all Releases.....10

Table 2A Liquid Effluents - Summation of all Releases..... 12

Table 1B Gaseous Effluents - Continuous and Batch Releases 14

Table 2B Liquid Effluents - Continuous and Batch Releases 16

Table 3 Solid Waste and Irradiated Fuel Shipments..... 18

Table 4A Radiation Dose to Nearest Individual Receptor from Gaseous Releases.... 19

Table 4B Radiation Dose to Nearest Individual Receptor from Liquid Releases..... 23

Table 5 Groundwater Monitoring Well Results.....24

Table 6 Dose due to Carbon-14 in Effluents.....25

1.0 INTRODUCTION

This Annual Radioactive Effluent Release Report is for the R.E. Ginna Nuclear Power Plant and is submitted in accordance with the requirements of Technical Specification Section 5.6.3. The report covers the period from January 1, 2010 through December 31, 2010.

This report includes a summary of the quantities of radioactive gaseous and liquid effluents and solid waste released from the plant presented in the format outlined in Appendix B of Regulatory Guide 1.21, Revision 1, June, 1974.

All gaseous and liquid effluents discharged during this reporting period were in compliance with the limits of the R.E. Ginna Technical Specifications as defined in the Offsite Dose Calculation Manual (ODCM).

2.0 SUPPLEMENTAL INFORMATION

2.1 Regulatory Limits

The ODCM limits applicable to the release of radioactive material in liquid and gaseous effluents are:

2.1.1 Fission and Activation Gases

The instantaneous dose rate, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to a release rate which would yield $\leq$ 500 mrem/yr to the total body and $\leq$ 3000 mrem/yr to the skin if allowed to continue for a full year.

The air dose, as calculated in the ODCM, due to noble gases released in gaseous effluents from the site shall be limited to the following:

(I) During any calendar quarter to $\leq$ 5 mrad for gamma radiation and to $\leq$ 10 mrad for beta radiation.

(ii) During any calendar year to $\leq$ 10 mrad for gamma radiation and to $\leq$ 20 mrad for beta radiation.

2.1.2 Radioiodine, Tritium and Particulates

The instantaneous dose rate, as calculated in the ODCM, due to radioactive materials released in gaseous effluents from the site as radioiodines, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days shall be limited to a release rate which would yield ≤ 1500 mrem/yr to any organ if allowed to continue for a full year.

The dose to an individual, as calculated in the ODCM, from radioiodine, radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight days released with gaseous effluents from the site shall be limited to the following:

(i) During any calendar quarter to ≤ 7.5 mrem to any organ.

(ii) During any calendar year to ≤ 15 mrem to any organ.

2.1.3 Liquid Effluents

The release of radioactive liquid effluents shall be such that the concentration in the circulating water discharge does not exceed the limits specified in accordance with Appendix B, Table II, Column 2 and notes thereto of 10CFR20, as explained in Section 1 of the ODCM. For dissolved or entrained noble gases the total activity due to dissolved or entrained noble gases shall not exceed 2E-04 uCi/ml.

The dose or dose commitment to an individual as calculated in the ODCM from radioactive materials in liquid effluents released to unrestricted areas shall be limited:

(i) During any calendar quarter to ≤ 1.5 mrem to the total body and to ≤ 5 mrem to any organ, and

(ii) During any calendar year to ≤ 3 mrem to the total body and to ≤ 10 mrem to any organ.

2.2 Effluent Concentration Limit (ECL)

2.2.1 For gaseous effluents, effluent concentration limits are not directly used in release rate calculations since the applicable limits are stated in terms of dose rate at the unrestricted area boundary, in accordance with Technical Specification 5.5.4.g.

2.2.2 For liquid effluents, ten times the effluent concentration values specified in 10CFR20, Appendix B, Table II, column 2, are used to calculate release rates and permissible concentrations at the unrestricted area boundary as permitted by Technical Specification 5.5.4.b. A value of 2E-04 uCi/ml is used as the ECL for dissolved and entrained noble gases in liquid effluents.

2.3 Release Rate Limits Based on Average Nuclide Energy

The release rate limits for fission and activation gases from the R.E. Ginna Nuclear Power Plant are not based on the average energy of the radionuclide mixture in gaseous effluents; therefore, this value is not applicable. However the 2010 average beta/gamma energy of the radionuclide mixture in fission and activation gases released from Ginna is available for review upon request.

2.4 Measurements and Approximations of Total Radioactivity

Gamma spectroscopy was the primary analysis method used to determine the radionuclide composition and concentration of gaseous and liquid effluents. Composite samples were analyzed for Sr-89, Sr-90, and Fe-55 by a contract laboratory. Tritium and alpha analysis were performed using liquid scintillation and gas flow proportional counting respectively.

The total radioactivity in effluent releases was determined from the measured concentration of each radionuclide present and the total volume of effluents released.

2.5 Batch Releases

2.5.1 Liquid

1. Number of batch releases:	9.4E+01
2. Total time period for batch releases:	2.34 E+04 min
3. Maximum time period for a batch release:	8.78 E+03 min
4. Average time period for batch releases:	2.49 E+02 min
5. Minimum time period for a batch release:	5.0 E+00 min
6. Average blowdown in liters per minute (LPM) during periods of effluent release into the discharge canal.	4.57 E+02 LPM

2.5.2 Gaseous

1. Number of batch releases:	4.4 E+01
2. Total time period for batch releases:	5.36 E+05 min
3. Maximum time period for a batch release:	4.46 E+04 min
4. Average time period for batch releases:	1.22 E+04 min
5. Minimum time period for a batch release:	3.50 E+01 min

2.6 Abnormal Releases

No abnormal releases occurred during the reporting period.

3.0 SUMMARY OF GASEOUS RADIOACTIVE EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables 1A and 1B. Plant Vent and Containment Vent releases are modeled as mixed mode and the Air Ejector is modeled as ground level release.

4.0 SUMMARY OF LIQUID RADIOACTIVE EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in tables 2A and 2B.

5.0 SOLID WASTE

The quantities of radioactive material released in shipments of solid waste transported from the site during the reporting period are summarized in Table 3. Principal nuclides were determined by gamma spectroscopy and non-gamma emitters were calculated from scaling factors determined by an independent laboratory from representative samples of that waste type. The majority of Dry Active Waste is processed utilizing an off-site processor who reduces the volume and then sends the waste for burial.

6.0 LOWER LIMIT OF DETECTION

The required Lower Limit of Detection, (LLD), as defined in the ODCM, was met for all samples used in reporting effluent releases for 2010.

7.0 RADIOLOGICAL IMPACT

An assessment of doses to the hypothetical maximally exposed individual member of the public from gaseous and liquid effluents was performed for locations representing the maximum calculated dose in occupied sectors. Meteorological sectors from WNW through ENE are entirely over Lake Ontario. In all cases, doses were well below Technical Specification limits as defined in the ODCM. Doses were assessed based upon historical meteorological conditions considering the noble gas exposure, inhalation, ground plane exposure, and ingestion pathways. The ingestion pathways considered were the fruit, vegetable, fish, drinking water, goat's milk, cow's milk and cow meat pathways. Results of this assessment are presented in Tables 4A and 4B.

7.1 Total Dose

40CFR190 limits the total dose to members of the public due to radiation and radioactivity from uranium fuel cycle sources to:

$\leq$ 25 mrem total body or any organ and;
$\leq$ 75 mrem thyroid for a calendar year.

Using the maximum exposure and uptake pathways, the maximum liquid pathways, and the maximum direct radiation measurements at the site boundary, yield the following dose summaries to the hypothetical maximally exposed individual member of the public. Dose to any real member of the public should be conservatively bounded by this calculated dose.

10.4 mrem total body (10.4 mrem direct radiation plus 2.4E-2 mrem all other pathways).
1.5E-2 mrem maximum organ dose (Bone).

8.0 METEOROLOGICAL DATA

The annual summary of hourly meteorological data collected during 2010 is not included with this report, but can be made available at the R. E. Ginna Nuclear Power Plant.

9.0 LAND USE CENSUS CHANGES

There were no major changes in critical receptor location for dose calculations during the reporting period. Minor changes in critical receptor locations and distances came from utilizing updated mapping technologies (hand held global positioning system and Google Earth software). There were no large changes in land use within 5 miles of the plant. Additional new homes are being built at a rate comparable to recent years.

10.0 CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

There were two changes made to the ODCM during 2010. The first change went into effect on August 10, 2010. This change is summarized as follows.

The revisions to table 5-2 of the Offsite Dose Calculation Manual (ODCM) have been proposed to achieve the following:

1. Present the data in an easier to read format.
2. Provide latitude and longitude coordinates for the air, water, milk, and dosimeter environmental sampling locations. This information, while not provided in the current version of the ODCM, is intended to provide additional detail regarding the environmental sampling program.
3. Update the directions and distances for the various environmental sampling locations.
4. Add two new dosimeters to Radiological Environmental Monitoring Program (REMP) for Independent Spent Fuel Storage Installation (ISFSI) direct dose monitoring.

The two new dosimeters have been located to monitor direct dose from the ISFSI in the western and south-southwestern meteorological sectors. ISFSI monitoring in the other meteorological sectors can be achieved using existing environmental sampling locations.

None of the existing sampling locations will be relocated as a result of this ODCM change. The compass directions and distances proposed in revision reflect more

The two new dosimeters have been located to monitor direct dose from the ISFSI in the western and south-southwestern meteorological sectors. ISFSI monitoring in the other meteorological sectors can be achieved using existing environmental sampling locations.

None of the existing sampling locations will be relocated as a result of this ODCM change. The compass directions and distances proposed in revision reflect more accurate measurements of the same locations, which were obtained using three independent technologies: a hand-held global position system (GPS), Google Earth software application, and mathematical equations

The second change went into effect on December 8, 2010. The constituents of this change:

1. Definitions Section, page 3. Revising the definition of Dose Equivalent I-131 from the thyroid dose conversion factors outlined in Regulatory Guide 1.109 to those in ICRP 30, Supplement to Part 1, Pages 192-212, table entitled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity", to align with definitions in the Technical Specifications.

2. Section 1.7, Liquid Effluent Dose, page 20, 21, and 22. Revising the average annual liquid dilution factor from 20 to 200. This was change was made as a result of a study performed by Hydroqual, titled "R.E. Ginna Nuclear Power Plant. Tracer Dilution Study for the Town of Ontario Municipal Drinking Water Intake." This study was published May 28, 2010. This liquid dilution study was performed as a result of Ontario Water district changing the location of their intake structure. The completed Hydroqual study is available upon request.

3. Section 2.0, Radioactive Gaseous Effluents, page 23. Correction to typographical error regarding 10 times 10CFR20 concentration limits at point of release.

4. Section 5.2, Table 5-2, page 79. Revised dosimeter sampling location 64 distance from the centerline of the reactor.

11.0 CHANGES TO THE PROCESS CONTROL PROGRAM

There were no changes to the Process Control Program during the reporting period.

12.0 MAJOR CHANGES TO RADWASTE TREATMENT SYSTEMS

There were no major changes to the Radwaste Treatment Systems during the reporting period.

13.0 INOPERABLE MONITORS

None

14.0 CHANGES TO PREVIOUS ANNUAL EFFLUENT OPERATING REPORTS

RPA-RW-PCP, "Process Control Program", was revised in 2007 under Procedure Change Request 2007-3427-001. These changes were to update titles, remove references that no longer existed, remove a configuration that is no longer utilized, and to remove the Green is Clean process that is no longer employed. The changes did not change the intent of the Procedure or the PCP. This change was not included in the 2007 Annual Radioactive Release report as required under Section 6.2 of the ODCM.

RPA-RW-PCP, "Process Control Program", was revised in 2008 under Procedure Change Request 2008-2107-001. This change provided clarification of when Ce-144 may be used to determine transuranics. The change does not change the intent of the PCP. This change was not included in the 2008 Annual Radioactive Release report as required under Section 6.2 of the ODCM.

15.0 GROUNDWATER MONITORING

In accordance with R. E. Ginna Nuclear Power Plant's Chemistry procedures, environmental groundwater monitoring wells are sampled quarterly. There are a total of 10 onsite groundwater monitoring wells:

- One located adjacent to the All Volatile Treatment (AVT) Building.
- Three located east of the Screenhouse, screened at 3 depths to include groundwater from top of the water table down to bedrock.
- Two located East of the Containment near the Technical Support Center (TSC)
- One southwest of the Administration Building.
- One to the west of the Screenhouse.
- One to the southeast of the Contaminated Storage Building (CSB).
- One located one-half mile southwest of the plant in the upgradient direction to serve as a control well.

Groundwater samples are analyzed for tritium to a detection limit of 500 pCi/L, and for gamma emitting radionuclides to the environmental LLDs. In 2010, no plant radioactivity was detected in groundwater samples.

Results of the groundwater monitoring well sampling are presented in Table 5.

Table 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

January - June 2010

A. Fission & Activation Gases	Unit	Quarter 1st	Quarter 2nd	Est. Total Error, %
1. Total release	Ci	1.67E-01	2.92E-01	1.50E+01
2. Average release rate for period	uCi/sec	2.11E-02	3.70E-02	
3. Percent of technical specification limit	%	3.35E-06	5.87E-06	
B. Iodines				
1. Total iodine-131	Ci	8.73E-09		1.50E+01
2. Average release rate for period	uCi/sec	1.11E-09		
3. Percent of technical specification limit	%	2.41E-06		
C. Particulates				
1. Particulates with half-lives > 8days	Ci			
2. Average release rate for period	uCi/sec			
3. Percent of technical specification limit	%			
4. Gross alpha radioactivity	Ci			
D. Tritium				
1. Total release	Ci	1.62E+01	1.24E+01	9.20E+00
2. Average release rate for period	uCi/sec	2.05E+00	1.57E+00	
3. Percent of technical specification limit	%	2.40E-04	1.84E-04	

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

July - December 2010

A. Fission & Activation Gases	Unit	Quarter 3rd	Quarter 4th	Est. Total Error, %
1. Total release	Ci	3.96E-01	3.01E-01	1.50E+01
2. Average release rate for period	uCi/sec	5.02E-02	3.81E-02	
3. Percent of technical specification limit	%	7.97E-06	6.05E-06	
B. Iodines				
1. Total iodine-131	Ci		1.56E-06	1.50E+01
2. Average release rate for period	uCi/sec		1.97E-07	
3. Percent of technical specification limit	%		4.28E-04	
C. Particulates				
1. Particulates with half-lives > 8days	Ci			
2. Average release rate for period	uCi/sec			
3. Percent of technical specification limit	%			
4. Gross alpha radioactivity	Ci			
D. Tritium				
1. Total release	Ci	1.62E+01	1.17E+01	9.20E+00
2. Average release rate for period	uCi/sec	2.06E+00	1.48E+00	
3. Percent of technical specification limit	%	2.41E-04	1.73E-04	

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

January - June 2010

A. Fission and activation products	Unit	Quarter 1st	Quarter 2nd	Est.Total Error, %
1. Total release (not including tritium, gases, alpha)	Ci	1.23E-03	6.97E-05	9.90E+00
2. Average diluted concentration during period	uCi/ml	3.03E-12	1.42E-13	
3. Percent of applicable limit	%	3.03E-05	1.42E-06	
B. Tritium				
1. Total release	Ci	1.42E+02	3.28E+01	9.20E+00
2. Average diluted concentration during period	uCi/ml	3.51E-07	6.71E-08	
3. Percent of applicable limit	%	3.51E-03	6.71E-04	
C. Dissolved and entrained gases				
1. Total release	Ci			
2. Average diluted concentration during period	uCi/ml			
3. Percent of applicable limit	%			
D. Gross alpha radioactivity				
1. Total release	Ci			
E. Vol. of waste released (prior to dilution)	Liters	9.67E+07	1.00E+08	
F. Vol. of dilution water used during period	Liters	4.04E+11	4.90E+11	

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

July - December 2010

A. Fission and activation products	Unit	Quarter 3rd	Quarter 4th	Est.Total Error, %
1. Total release (not including tritium, gases, alpha)	Ci			
2. Average diluted concentration during period	uCi/ml			
3. Percent of applicable limit	%			
B. Tritium				
1. Total release	Ci	3.20E+01	5.00E+01	9.20E+00
2. Average diluted concentration during period	uCi/ml	6.33E-08	1.04E-07	
3. Percent of applicable limit	%	6.33E-04	1.04E-03	
C. Dissolved and entrained gases				
1. Total release	Ci			
2. Average diluted concentration during period	uCi/ml			
3. Percent of applicable limit	%			
D. Gross alpha radioactivity				
1. Total release	Ci			
E. Vol. of waste released (prior ro dilution)	Liters	1.00E+08	1.00E+08	
F. Vol. of dilution water used during period	Liters	5.05E+11	4.81E+11	

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

GASEOUS EFFLUENTS - CONTINUOUS AND BATCH RELEASES

January - June 2010

		Continuous Mode		Batch Mode	
Nuclides released	Unit	Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
1. Fission gases					
argon-41	Ci			7.08E-02	7.12E-02
krypton-85	Ci				
krypton-85m	Ci				
krypton-87	Ci				
krypton-88	Ci				
xenon-131m	Ci				
xenon-133	Ci			9.46E-02	2.17E-01
xenon-133m	Ci				
xenon-135	Ci			1.26E-03	3.40E-03
xenon-135m	Ci				
xenon-138	Ci				
others (specify)	Ci				
	Ci				
Total for period	Ci			1.67E-01	2.92E-01
2. Iodines					
iodine-131	Ci			8.73E-09	
iodine-132	Ci				
iodine-133	Ci				
iodine-135	Ci				
Total for period	Ci			8.73E-09	
3. Particulates					
strontium-89	Ci				
strontium-90	Ci				
cesium-134	Ci				
cesium-137	Ci				
cobalt-58	Ci				
unidentified	Ci				
Total for period	Ci				
4. Tritium					
Hydrogen-3	Ci	1.60E+01	1.23E+01	1.65E-01	6.86E-02

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

GASEOUS EFFLUENTS - CONTINUOUS AND BATCH RELEASES

July - December 2010

		Continuous Mode		Batch Mode	
Nuclides released	Unit	Quarter	Quarter	Quarter	Quarter
		3rd	4th	3rd	4th
1. Fission gases					
argon-41	Ci			6.87E-02	7.13E-02
krypton-85	Ci				
krypton-85m	Ci				
krypton-87	Ci				
krypton-88	Ci				
xenon-131m	Ci				
xenon-133	Ci			3.22E-01	2.26E-01
xenon-133m	Ci				
xenon-135	Ci			4.75E-03	3.47E-03
xenon-135m	Ci				
xenon-138	Ci				
others (specify)	Ci				
	Ci				
unidentified	Ci				
Total for period	Ci			3.95E-01	3.01E-01
2. Iodines					
iodine-131	Ci		1.56E-06		
iodine-133	Ci		5.18E-06		
iodine-135	Ci				
Total for period	Ci		6.74E-06		
3. Particulates					
strontium-89	Ci				
strontium-90	Ci				
cesium-134	Ci				
cesium-137	Ci				
cobalt-58	Ci				
unidentified	Ci				
Total for period	Ci				
4. Tritium					
Hydrogen-3	Ci	1.61E+01	1.16E+01	8.27E-02	2.95E-02

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

Liquid Effluents

January - June 2010

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
		1st	2nd	1st	2nd
chromium-51	Ci				
manganese-54	Ci				
iron-55	Ci				
iron-59	Ci				
cobalt-58	Ci			1.22E-03	6.97E-05
cobalt-60	Ci			1.94E-08	
zinc-65	Ci				
strontium-89	Ci				
strontium-90	Ci				
niobium-95	Ci				
molybdenum-99	Ci				
silver-110m	Ci				
antimony-122	Ci				
antimony-124	Ci				
antimony-125	Ci				
iodine-131	Ci				
iodine-132	Ci				
iodine-135	Ci				
cesium-134	Ci				
cesium-136	Ci				
cesium-137	Ci				
barium/lanthanum-140	Ci				
cerium-141	Ci				
Te-123m	Ci			7.35E-06	
Zr-95	Ci				
Co-57	Ci				
Total for period (above)	Ci			1.23E-03	6.97E-05
unidentified	Ci				
Tritium	Ci	6.42E-02	1.33E-01	1.42E+02	3.27E+01
xenon-133	Ci				
xenon-135	Ci				

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

Liquid Effluents

July - December 2010

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
		3rd	4th	3rd	4th
chromium-51	Ci				
manganese-54	Ci				
iron-55	Ci				
iron-59	Ci				
cobalt-58	Ci				
cobalt-60	Ci				
zinc-65	Ci				
strontium-89	Ci				
strontium-90	Ci				
niobium-95	Ci				
molybdenum-99	Ci				
silver-110m	Ci				
antimony-122	Ci				
antimony-124	Ci				
antimony-125	Ci				
iodine-131	Ci				
iodine-132	Ci				
iodine-135	Ci				
cesium-134	Ci				
cesium-136	Ci				
cesium-137	Ci				
barium/lanthanum-140	Ci				
cerium-141	Ci				
Te-123m	Ci				
Zr-95	Ci				
Co-57	Ci				
Total for period (above)	Ci				
unidentified	Ci				
Tritium	Ci	1.81E-01	1.78E-01	3.18E+01	4.99E+01
xenon-133	Ci				
xenon-135	Ci				

Note: Isotopes for which no value is given were not identified in applicable releases.

Table 3
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
January 1, 2009 - December 31, 2009

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL- (Not irradiated fuel)

1. Type of waste	Unit	12 month period	Est. total Error %
a.Spent resins, filter sludges, evaporator bottoms, etc.	m^3 Ci	8.55 20.2	7.0 E+00 1.4 E+01
b. Dry compressible waste, contaminated equip, etc.	m^3 Ci	237.8 0.724	7.0 E+00 1.4 E+01
c.Irradiated components, control rods, etc.	m^3 Ci	None	N/A N/A
d.Other: None	m^3 Ci	None	N/A N/A

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

a.			b.			c.		
Co-58	%	2.23	Co-58	%	8.35	None	%	None
Ni-63	%	61.13	Fe-55	%	2.93		%	
C-14	%	7.73	Sb-125	%	6.38		%	
Cs-137	%	2.5	Co-60	%	3.43		%	
Co-60	%	9.3	Ni-63	%	76.8		%	
Fe-55	%	8.18	Mn-54	%	0.68		%	
Mn-54	%	0.13	Ni-59	%	0.28		%	
Ni-59	%	4.68	Co-57	%	0.35		%	
H-3	%	2.16	Cs-137	%	0.03		%	
Sb-125	%	0.45	Ag-110m	%	0.27		%	
Nb-95	%	0.11		%			%	
Total		98.6%	Total		99.5	Total		0

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
4	Sole Use Truck	Energy Solutions
5	Sole Use Truck	Studsvic

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None		

Table 4A

Radiation Dose to Maximum Individual Receptor

First Quarter 2010

(Units In milliRem)

	All	All	Adult	Teen	Child	Infant
	Gamma Air	Beta Air	THYRD	THYRD	THYRD	THYRD
N	1.88E-06	9.08E-07	2.23E-04	2.45E-04	3.36E-04	1.47E-04
NNE	1.58E-06	7.61E-07	1.87E-04	2.05E-04	2.81E-04	1.23E-04
NE	1.82E-06	8.77E-07	2.16E-04	2.36E-04	3.24E-04	1.42E-04
ENE	2.31E-06	1.11E-06	2.74E-04	3.00E-04	4.12E-04	1.80E-04
E	4.21E-06	2.03E-06	4.98E-04	5.46E-04	7.50E-04	3.28E-04
ESE	5.35E-06	2.58E-06	6.34E-04	6.95E-04	9.54E-04	4.17E-04
SE	3.24E-06	1.56E-06	3.84E-04	4.20E-04	5.77E-04	2.52E-04
SSE	1.33E-06	6.42E-07	1.58E-04	1.73E-04	2.38E-04	1.04E-04
S	2.33E-06	1.12E-06	2.76E-04	3.03E-04	4.16E-04	1.82E-04
SSW	2.33E-06	1.12E-06	2.76E-04	3.03E-04	4.16E-04	1.82E-04
SW	2.33E-06	1.12E-06	2.76E-04	3.03E-04	4.16E-04	1.82E-04
WSW	2.49E-06	1.20E-06	2.95E-04	3.23E-04	4.44E-04	1.94E-04
W	1.58E-06	7.64E-07	1.88E-04	2.06E-04	2.82E-04	1.23E-04
WNW	1.34E-07	6.45E-08	1.59E-05	1.74E-05	2.39E-05	1.04E-05
NW	4.39E-07	2.12E-07	5.20E-05	5.70E-05	7.82E-05	3.42E-05
NNW	1.37E-06	6.60E-07	1.62E-04	1.78E-04	2.44E-04	1.07E-04
MAX.	5.35E-06	2.58E-06	6.34E-04	6.95E-04	9.54E-04	4.17E-04

Table 4A

Radiation Dose to Maximum Individual Receptor

Second Quarter 2010

(Units In milliRem)

	All	All	Adult	Teen	Child	Infant
	Gamma Air	Beta Air	THYRD	THYRD	THYRD	THYRD
N	2.02E-06	1.27E-06	1.55E-06	1.69E-04	2.33E-04	1.02E-04
NNE	1.70E-06	1.07E-06	1.30E-06	1.42E-04	1.95E-04	8.53E-05
NE	1.96E-06	1.23E-06	1.50E-06	1.64E-04	2.25E-04	9.83E-05
ENE	2.48E-06	1.56E-06	1.90E-06	2.08E-04	2.86E-04	1.25E-04
E	4.52E-06	2.85E-06	3.46E-06	3.78E-04	5.20E-04	2.27E-04
ESE	5.75E-06	3.62E-06	4.40E-06	4.81E-04	6.61E-04	2.89E-04
SE	3.48E-06	2.19E-06	2.66E-06	2.91E-04	4.00E-04	1.75E-04
SSE	1.43E-06	9.01E-07	1.10E-06	1.20E-04	1.65E-04	7.20E-05
S	2.51E-06	1.58E-06	1.92E-06	2.10E-04	2.88E-04	1.26E-04
SSW	2.51E-06	1.58E-06	1.92E-06	2.10E-04	2.88E-04	1.26E-04
SW	2.51E-06	1.58E-06	1.92E-06	2.10E-04	2.88E-04	1.26E-04
WSW	2.67E-06	1.68E-06	2.05E-06	2.24E-04	3.07E-04	1.34E-04
W	1.70E-06	1.07E-06	1.30E-06	1.42E-04	1.96E-04	8.55E-05
WNW	1.44E-07	9.05E-08	1.10E-07	1.20E-05	1.65E-05	7.23E-06
NW	4.72E-07	2.97E-07	3.61E-07	3.94E-05	5.42E-05	2.37E-05
NNW	1.47E-06	9.27E-07	1.13E-06	1.23E-04	1.69E-04	7.40E-05
MAX.	5.75E-06	3.62E-06	4.40E-06	4.81E-04	6.61E-04	2.89E-04

Table 4A

Radiation Dose to Maximum Individual Receptor

Third Quarter 2010

(Units In milliRem)

	All	All	Adult	Teen	Child	Infant
	Gamma Air	Beta Air	THYRD	THYRD	THYRD	THYRD
N	2.07E-06	1.56E-06	2.03E-04	2.22E-04	3.05E-04	1.33E-04
NNE	1.73E-06	1.31E-06	1.70E-04	1.86E-04	2.56E-04	1.12E-04
NE	2.00E-06	1.51E-06	1.96E-04	2.15E-04	2.95E-04	1.29E-04
ENE	2.54E-06	1.91E-06	2.49E-04	2.73E-04	3.75E-04	1.64E-04
E	4.61E-06	3.48E-06	4.54E-04	4.96E-04	6.81E-04	2.98E-04
ESE	5.87E-06	4.43E-06	5.77E-04	6.31E-04	8.67E-04	3.79E-04
SE	3.55E-06	2.68E-06	3.49E-04	3.82E-04	5.25E-04	2.29E-04
SSE	1.46E-06	1.10E-06	1.44E-04	1.57E-04	2.16E-04	9.44E-05
S	2.56E-06	1.93E-06	2.52E-04	2.75E-04	3.78E-04	1.65E-04
SSW	2.56E-06	1.93E-06	2.52E-04	2.75E-04	3.78E-04	1.65E-04
SW	2.56E-06	1.93E-06	2.52E-04	2.75E-04	3.78E-04	1.65E-04
WSW	2.73E-06	2.06E-06	2.68E-04	2.93E-04	4.03E-04	1.76E-04
W	1.74E-06	1.31E-06	1.71E-04	1.87E-04	2.57E-04	1.12E-04
WNW	1.47E-07	1.11E-07	1.44E-05	1.58E-05	2.17E-05	9.48E-06
NW	4.81E-07	3.63E-07	4.73E-05	5.17E-05	7.11E-05	3.11E-05
NNW	1.50E-06	1.13E-06	1.48E-04	1.62E-04	2.22E-04	9.70E-05
MAX.	5.87E-06	4.43E-06	5.77E-04	6.31E-04	8.67E-04	3.79E-04

Table 4A

Radiation Dose to Maximum Individual Receptor

Fourth Quarter 2010

(Units In milliRem)

	All	All	Adult	Teen	Child	Infant
	Gamma Air	Beta Air	THYRD	THYRD	THYRD	THYRD
N	2.03E-06	1.30E-06	1.89E-04	2.07E-04	2.84E-04	1.24E-04
NNE	1.71E-06	1.09E-06	1.58E-04	1.73E-04	2.38E-04	1.04E-04
NE	1.97E-06	1.26E-06	1.83E-04	2.00E-04	2.75E-04	1.20E-04
ENE	2.50E-06	1.60E-06	2.32E-04	2.54E-04	3.49E-04	1.52E-04
E	4.54E-06	2.91E-06	4.22E-04	4.62E-04	6.35E-04	2.77E-04
ESE	5.78E-06	3.70E-06	5.37E-04	5.88E-04	8.08E-04	3.53E-04
SE	3.50E-06	2.24E-06	3.25E-04	3.56E-04	4.89E-04	2.14E-04
SSE	1.44E-06	9.21E-07	1.34E-04	1.46E-04	2.01E-04	8.79E-05
S	2.52E-06	1.61E-06	2.34E-04	2.56E-04	3.52E-04	1.54E-04
SSW	2.52E-06	1.61E-06	2.34E-04	2.56E-04	3.52E-04	1.54E-04
SW	2.52E-06	1.61E-06	2.34E-04	2.56E-04	3.52E-04	1.54E-04
WSW	2.69E-06	1.72E-06	2.50E-04	2.73E-04	3.76E-04	1.64E-04
W	1.71E-06	1.10E-06	1.59E-04	1.74E-04	2.39E-04	1.04E-04
WNW	1.45E-07	9.25E-08	1.34E-05	1.47E-05	2.02E-05	8.83E-06
NW	4.74E-07	3.03E-07	4.40E-05	4.82E-05	6.63E-05	2.89E-05
NNW	1.48E-06	9.47E-07	1.37E-04	1.51E-04	2.07E-04	9.04E-05
MAX.	5.78E-06	3.70E-06	5.37E-04	5.88E-04	8.08E-04	3.53E-04

Table 4B

Radiation Dose To Maximum Individual Receptor

From Liquid Release 2010

(Units in milliRem)

	Adult	Teen	Child	Infant
First Quarter				
T. Body	1.61E-03	1.17E-03	1.78E-03	1.40E-03
GI-LLI	1.64E-03	1.19E-03	1.78E-03	1.40E-03
Thyroid	1.60E-03	1.16E-03	1.77E-03	1.40E-03
Second Quarter				
T. Body	2.89E-04	2.10E-04	3.20E-04	2.53E-04
GI-LLI	2.91E-04	2.11E-04	3.20E-04	2.53E-04
Thyroid	2.89E-04	2.10E-04	3.20E-04	2.53E-04
Third Quarter				
T. Body	2.83E-04	2.06E-04	3.13E-04	2.47E-04
GI-LLI	2.83E-04	2.06E-04	3.13E-04	2.47E-04
Thyroid	2.83E-04	2.06E-04	3.13E-04	2.47E-04
Fourth Quarter				
T. Body	3.64E-04	2.67E-04	3.79E-04	2.73E-04
GI-LLI	3.64E-04	2.67E-04	3.79E-04	2.73E-04
Thyroid	3.64E-04	2.67E-04	3.79E-04	2.73E-04

TABLE 5

Groundwater Monitoring Wells

Location	Sample Date	Tritium
GW01: Warehouse Access Road (Control)	09/23/10	*
	12/10/10	*
GW02: Butler Building	03/17/10	*
	06/08/10	*
GW04: Screenhouse West, North Well	03/31/10	*
	05/12/10	*
	06/08/10	*
	07/14/10	*
	09/23/10	*
	10/15/10	*
	10/10/10	*
	12/10/10	*
GW05: Screenhouse East, South (15.5')	03/17/10	*
	04/13/10	*
	06/08/10	*
	09/23/10	*
	12/10/10	*
GW06: Screenhouse East, Middle (20.0')	03/17/10	*
	04/13/10	*
	05/12/10	*
	06/08/10	*
	07/14/10	*
	08/17/10	*
	09/23/10	*
	12/10/10	*
GW07: Screenhouse East, North (24.0')	03/17/10	*
	04/13/10	*
	06/08/10	*
	09/23/10	*
	12/10/10	*
GW08: All Volatiles Treatment Building	09/23/10	*
	10/15/10	*
	11/10/10	*
	12/10/10	*
GW09: Technical Support Center, North	09/24/10	*
	12/10/10	*
GW10: Technical Support Center, South	09/24/10	*
	12/10/10	*
GW11: Contaminated Service Building, SE (24.0')	03/17/10	*
	06/08/10	*
	06/11/10	*
	06/19/10	*
	09/23/10	*
	12/10/10	*

* - Activity less than detectable (Tritium)

Table 6

2010 Offsite Dose Due to Carbon-14

R E Ginna Nuclear Power Plant

A study of Carbon-14 in effluent releases from Ginna was conducted in 1982 by Charles Kunz of New York State Department of Health, Center for Laboratories and Research. Results of this study are used as the basis for current Carbon-14 production and releases at Ginna. Using the Carbon-14 releases measured in the Kunz study at 4.3 Curies, adjusted for power uprate from 490 MWe to 580 MWe, and adjusted for increased capacity factor, leads to a conservative estimate of 6.8 Curies released in gaseous effluents in 2010. Kunz further determined the chemical form of the Carbon-14 at Ginna to be approximately 10% CO2.

As a cross-check, the EPRI Carbon-14 Source Term Calculator was used to estimate Carbon-14 releases from Ginna, using Ginna specific reactor core data and reactor coolant chemistry to estimate the products of the activation reactions. The resulting estimate of 6.9 Curies per EFPY agrees with the Kunz data.

Dose due to Carbon-14 in gaseous effluents was calculated using the following conditions:

a. 6.8 Curies of C-14 released to atmosphere in 2010
b. Release was consistent throughout the year. There was no outage in 2010.
c. 10% of the C-14 was in the chemical form of CO2, which is the only dose contributor. The bulk of C-14 was in the chemical form of methane (CH4) which would exhibit high upward velocity due to its low density relative to air. In addition CH4 does not have an uptake pathway for humans.
d. Meteorological dispersion factor, (X/Q), at the site boundary to the hypothetical maximally exposed member of the public is 2.43E-07 sec/m^3.
e. Dose calculations and dose factors are from Regulatory Guide 1.109 methodology.
f. Pathways considered were inhalation and vegetation ingestion.
g. Critical receptor is child at the site boundary in the ESE direction.

MAXIMUM DOSE VALUES DUE TO C-14 IN GASEOUS EFFLUENTS IN 2010

Organ	Age	mRem/yr
RG-1.109 Bone	Child	1.94E-02
RG-1.109 T.Body/Other	Child	3.86E-03

Dose due to Carbon-14 in liquid effluents was calculated using the following conditions:

a. The liquid waste processing system at Ginna has not been evaluated for efficiency of removal of Carbon-14. Therefore no removal term was used in estimation of offsite dose.
b. Average concentration of C-14 in waste water as measured in the Kunz study was adjusted for current operating conditions and was 6.0E-7 uCi/cc.
c. 1.99E6 liters of liquid waste were released in 2010 with total dilution flow of 1.88E12 liters.
d. Average diluted concentration of C-14 released was 6.35E-13 uCi/cc.
e. Liquid effluent dilution factor for potable water pathway is 20.
f. Liquid effluent dilution factor for fish pathway is 1.
g. Dose calculations and dose factors are from Regulatory Guide 1.109 methodology.
h. Critical receptor is teen for both potable water and fish pathways.

MAXIMUM DOSE VALUES DUE TO C-14 IN LIQUID EFFLUENTS IN 2010

Organ	Age	mRem/yr
RG-1.109 Bone	Teen	1.90E-04
RG-1.109 T.Body/Other	Teen	3.79E-05