ATTACHMENT 1

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1, 2014 – DECEMBER 31, 2014

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT: JANUARY 1, 2014 – DECEMBER 31, 2014

MAY 2015

R.E. Ginna Nuclear Power Plant
1503 Lake Road
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1.0 INTRODUCTION

R.E. Ginna Nuclear Power Plant (Ginna) has prepared this Annual Radioactive Effluent Release Report (ARERR) in accordance with the requirements of Technical Specification Section 5.6.3.

This report, covering the period from January 1, 2014 through December 31, 2014, provides 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 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 that 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 eight days shall be limited to a release rate

that would yield ≤ 1500 mrem/yr to any organ if allowed to continue for a full year.

Dose to an individual from radioiodine, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than eight days released with gaseous effluents is calculated in accordance with ODCM methodology. The dose to an individual shall be limited to:

(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 10 times the limits specified in Appendix B, Table II, Column 2 and notes thereto of 10 CFR 20, 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 from radioactive materials in liquid effluents released to unrestricted areas is calculated according to ODCM methodology and is limited to:

(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 Limits (ECLs)

2.2.1 For gaseous effluents, effluent concentration limits (ECLs) 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, ECLs ten times those specified in 10 CFR 20, 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 2014 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 Fe-55, Ni-63, Sr-89, and Sr-90 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 in a representative sample and the total volume of effluents released.

2.5 Batch Releases

2.5.1 Liquid

1. Number of batch releases:	1.19E+02
2. Total time period for batch releases (Minutes):	1.90 E+04
3. Maximum time period for a batch release (Minutes):	1.44 E+03
4. Average time period for batch releases (Minutes):	1.60 E+02
5. Minimum time period for a batch release:	3.00 E+01
6. Average effluent release flowrate into the discharge canal (Liters per Minute):	2.92 E+02
7. Average dilution flowrate of discharge canal during effluent releases (Liters per Minute):	1.13 E+06

2.5.2 Gaseous

1. Number of batch releases:	2.0 E+01
2. Total time period for batch releases (Minutes):	4.93 E+05
3. Maximum time period for a batch release (Minutes):	4.46 E+04
4. Average time period for batch releases (Minutes):	2.47 E+04
5. Minimum time period for a batch release (Minutes):	8.5 E+01

2.6 Abnormal Releases

Two abnormal releases occurred in 2014.

1. Just prior to the 2014 refueling outage on 4/27/14, a leak on the Volume Control Tank (VCT) nitrogen regulator released noble gas to the Plant Vent during VCT purges. The increased noble gas activity was detected on Plant Vent Gas monitor R-14 and a grab sample was taken to quantify the release. Non-routine batch gas release permit G-2014016 was generated to calculate the dose consequence of approximately 64 mci of Xe-135 released.
2. During 2014 refueling outage the VCT was drained to the Waste Holdup Tank (WHT) on 4/30/14. During this evolution approximately 77 mCi of Xe-133 was released through the plant vent and documented in non-routine batch gas release permit G-2014018.

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 a 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 Ginna 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 that reduces the volume and then transports the waste to a permitted landfill for disposal.

6.0 LOWER LIMIT OF DETECTION

The required Lower Limit of Detection (LLD), as defined in Table 2-1 of the ODCM, was not satisfied on one occasion:

On May 2, 2014, the LLDs for Mo-99, I-131, and Ce-144 were not met on Plant Vent R-10B, R-13, R-14 grab samples used in gaseous release permit G-2014011, due to short run time on sampler which resulted in insufficient sample volume to meet the LLDs..

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 to the north from NW through ENE are entirely over Lake Ontario, while the remaining meteorological sectors to the south (WNW through E) are over land. 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

40 CFR 190 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, including C-14 dose, 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. The maximum total body dose is determined by summing the hypothetical maximum direct radiation dose exposure and the total body dose from gaseous and liquid pathways. Dose to any real member of the public should be conservatively bounded by these calculated doses:

- Maximum Annual Total Body Dose: 11.7 mRem (Sum of 11.7 mrem direction radiation, 7.66E-03 (Total Body Liquid Dose), 2.88E-03 (Total Body Gas Dose).
- Maximum Annual Organ Dose: 2.3E-02 mrem (Child bone C-14)
- Maximum Annual Thyroid Dose: 1.61E-02 mrem (Teen)

8.0 METEOROLOGICAL DATA

The annual summary of hourly meteorological data collected during 2014 is not included with this report, but can be made available upon request.

9.0 LAND USE CENSUS CHANGES

In September 2014, Ginna staff conducted a Land Use Survey to identify the location of the nearest milk animal, the nearest residence, and the nearest garden greater than 50 square meters in each of the nine sectors within a 5-mile radius of the power plant. The Land Use Survey is conducted in accordance with Ginna procedures.

Over the past year, the following land use observations were made within a 5-mile radius of the power plant:

- The nearest residence remains in the SSE sector, approximately 610 meters from the reactor.
- The Monroe County Water Authority (MCWA) completed construction of a new municipal water pump station facility located at 1720 Lake Road (west of the plant) in 2013 and commenced operation in May 2014. Ginna Chemistry staff began collecting raw water samples as part of its Radiological Environmental Monitoring Program (REMP) in June 2014.
- Single family home construction was observed at various locations within the 5 mile REMP zone, at rates consistent with past years.
- No new agricultural land use was identified.
- No new food producing facilities were identified.
- No new milk producing animals were identified.

10.0 CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

There were two changes to the Offsite Dose Calculation Manual (ODCM) in 2014.

1. Revision 28 of the ODCM, effective 2/4/14, included a Table of Contents as well as a List of Acronyms and editorial clarifications to references and a clarification to the symbol used for a variable in an equation.

2. Revision 29 of the ODCM, effective 6/27/14, updated Table 2-2 to reflect a revised dispersion factor for radiation monitor R-48.

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 significant changes to the Radwaste Treatment Systems during the reporting period.

13.0 INOPERABLE MONITORS

RM-14A, Plant Vent Accident range gas monitor, failed calibration on 6/5/14 and was out of service until 6/18/14 at 1400, greater than 7 day reporting required in this report by ODCM Table 3.3-1.

14.0 CHANGES TO PREVIOUS ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORTS

The 2013 Land Use Census listed Eaton milk farm as in the South East sector at 8270 meters. The Eaton milk farm is actually in the East South East sector at 8240 meters.

In the 2012 Annual Radioactive Effluent Release Report, Table 2A, B.3, Tritium percent of applicable limit in liquid effluents was wrong for each of 4 quarters-

3. Percent of applicable limit	%	9.30E+05	1.67E+06	2.88E+6	1.66E+06

This should have been reported as –

3. Percent of applicable limit	%	9.30E-05	1.67E-06	2.88E-06	1.66E-06

15.0 GROUNDWATER MONITORING

In accordance Ginna's Chemistry procedures, environmental groundwater monitoring wells are sampled on a routine frequency. During 2013, five new groundwater monitoring wells were installed. In 2014, Ginna staff collected and analyzed samples collected from a total of 14 groundwater monitoring wells:

- GW01: Warehouse Access Road (Control)
- GW03: Screenhouse West, South Well
- GW04: Screenhouse West, North Well
- GW05: Screenhouse East, South
- GW06: Screenhouse East, Middle
- GW07: Screenhouse East, North
- GW08: All Volatiles Treatment Building
- GW10: Technical Support Center, South
- GW11: Southeast of Contaminated Storage Building (CSB)
- GW12: West of Orchard Access Road*
- GW13: North of Independent Spent Fuel Storage Installation (ISFSI)*
- GW14: South of Canister Preparation Building*
- GW15: West of Manor House*
- GW16: Southeast of Manor House*

* - Asterisks denote new groundwater wells installed in 2013.

Groundwater samples are analyzed for tritium to a detection limit of 500 pCi/L and for gamma emitting radionuclides to the environmental LLDs. The analytical results for groundwater monitoring well samples collected during 2014 are presented in Table 5.

All samples collected during 2014, which were analyzed for tritium and gamma emitting nuclides, did not yield a concentration greater than the calculated MDA.

16.0 OFFSITE DOSE DUE TO CARBON-14

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 2014. Kunz further determined the chemical form of the Carbon-14 at Ginna to be approximately 10% Carbon Dioxide (CO_2).

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 Equivalent Full Power Year (EFPY) agrees with the Kunz data.

16.1 Gaseous Effluents

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

a. 6.8 Curies of C-14 were released to atmosphere in 2014.
b. There was a refueling outage in 2014. However, according to the Kunz study it has little or no impact on the C-14 effluents and was not considered in this report.
c. 10% of the C-14 was in the chemical form of CO_2, which is the only dose contributor. The bulk of C-14 is released in the chemical form of methane (CH4). Methane would exhibit high upward velocity due to its low density relative to air. Additionally, 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, milk consumption, and vegetation ingestion.
g. The critical receptor is a child at the site boundary in the ESE direction.

See Table 6 for an estimate of Carbon-14 in gaseous effluents during 2014.

16.2 Liquid Effluents

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-07 uCi/cc.
c. 5.24E+05 liters of liquid waste (with the potential to contain C-14) were released with a total dilution flow of 1.91E+12 liters.
d. Average diluted concentration of C-14 released was 1.58E-13 uCi/cc.
e. Liquid effluent dilution factor for potable water pathway is 200.
f. Liquid effluent dilution factor for fish pathway is 1.

g. Dose calculations and dose factors are from Regulatory Guide 1.109 methodology.
h. The critical receptor is a child for the fish consumption pathway and the infant is the critical receptor for the potable water pathway.

See Table 6 for an estimate of Carbon-14 in liquid effluents during 2014.

TABLE 1A
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
2014

Effluent Type	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Gases						
1. Total release	Ci	6.06E-01	6.16E+00	8.64E-01	1.03E+00	2.80E+01
2. Average release rate for period	uCi/sec	7.68E-02	7.82E-01	1.10E-01	1.30E-01	
3. Percent of technical specification limit	%	1.22E-05	1.24E-04	1.75E-05	2.06E-05	
B. Iodines						
1. Total iodine-131	Ci	0.00E+00	2.32E-04	0.00E+00	0.00E+00	2.20E+01
2. Average release rate for period	uCi/sec	0.00E+00	2.95E-05	0.00E+00	0.00E+00	
3. Percent of technical specification limit	%	0.00E+00	6.41E-02	0.00E+00	0.00E+00	
C. Particulates						
1. Particulates with half-lives > 8days	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
2. Average release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of technical specification limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross alpha radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
D. Tritium						
1. Total release	Ci	3.22E+01	3.46E+01	2.62E+01	2.26E+01	1.50E+00
2. Average release rate for period	uCi/sec	4.08E+00	4.38E+00	3.32E+00	2.87E+00	
3. Percent of technical specification limit	%	4.78E-06	5.13E-06	3.89E-06	3.36E-06	

Notes: 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
2014

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1. Fission Gases									
Argon-41	Ci		3.91E-01			9.44E-02	5.97E-02	6.58E-02	6.61E-02
Krypton-85	Ci						6.42E-01		
Krypton-85m	Ci								
Krypton-87	Ci								
Krypton-88	Ci								
Xenon-131m	Ci								
Xenon-133	Ci		1.65E+00			2.07E-01	2.71E-01	3.48E-01	4.32E-01
Xenon-133m	Ci								
Xenon-135	Ci					1.35E-03	6.96E-02	1.89E-02	1.43E-03
Xenon-135m	Ci								
Xenon-138	Ci								
Total for period	Ci		2.04E+00			3.03E-01	1.04E+00	6.06E-01	5.00E-01
2. Iodines									
Iodine-131	Ci		1.16E-04				1.18E-08		
Iodine-132	Ci								
Iodine-133	Ci								
Iodine-135	Ci								
Total for period	Ci		1.16E-04				1.18E-08		

TABLE 1B (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - CONTINUOUS AND BATCH RELEASES
2014

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
3. Particulates									
strontium-89	Ci								
strontium-90	Ci								
cesium-137	Ci								
cobalt-57	Ci								
cobalt-58	Ci								
cobalt-60	Ci								
Unidentified	Ci								
Total for period	Ci								
4. Tritium									
Hydrogen-3	Ci	3.22E+01	3.46E+01	2.62E+01	2.26E+01	9.07E-02	4.29E-02	1.12E-01	8.31E-02

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
2014

Effluent Type	Units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Est. Total Error, %
A. Fission & Activation Products						
1. Total Release (not including tritium, gases, alpha)	Ci	1.47E-04	3.55E-03	9.28E-04	1.41E-04	1.90E+01
2. Average Diluted concentration	uCi/ml	4.43E-13	9.07E-12	1.80E-12	2.86E-13	
3. Percent of applicable limit	%	4.43E-06	9.07E-05	1.80E-5	2.86E-06	
B. Tritium						
1. Total Release	Ci	3.23E+02	1.50E+02	3.75E+01	2.25E+01	9.20E+00
2. Average Diluted Concentration	uCi/ml	9.75E-07	3.83E-07	7.26E-08	4.55E-08	
3. Percent of applicable limit	%	9.75E-03	3.83E-03	7.26E-04	4.55E-04	
C. Dissolved and Entrained Gases						
1. Total Release	Ci	3.30E-03	8.45E-03	0.00E+00	0.00E+00	1.90E+01
2. Average Diluted Concentration	uCi/ml	9.96E-12	2.16E-11	0.00E+00	0.00E+00	
3. Percent of applicable limit	%	9.96E-06	2.16E-05	0.00E+00	0.00E+00	
D. Gross Alpha Radioactivity						
1. Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
E. Vol. of Waste Released (prior to dilution)	Liters	1.23E+08	1.02E+08	1.27E+08	1.21E+08	
F. Vol. of Dilution Water Used During Period	Liters	3.32E+11	3.92E+11	5.16E+11	4.95E+11	

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

TABLE 2B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – CONTINUOUS AND BATCH RELEASES
2014

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Fission & Activation Products									
Chromium-51	Ci								
Manganese-54	Ci								
Iron-55	Ci								
Iron-59	Ci								
Cobalt-57	Ci								
Cobalt-58	Ci					1.47E-04	3.55E-03	8.39E-04	6.95E-05
Cobalt-60	Ci							9.12E-08	
Zinc-65	Ci								
Strontium-89	Ci								
Strontium-90	Ci								
Niobium-95	Ci								
Molybdenum-99	Ci								
Zirconium-95	Ci								
Silver-110m	Ci								
Antimony-122	Ci								
Tellurium-123m	Ci								7.19E-05
Antimony-124	Ci								
Antimony-125	Ci								
Iodine-131	Ci								
Iodine-132	Ci						2.61E-07		
Tellurium-132	Ci								
Iodine-135	Ci								
Cesium-134	Ci								
Cesium-136	Ci								
Cesium-137	Ci							8.93E-05	

TABLE 2B (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS – CONTINUOUS AND BATCH RELEASES
2014

Nuclides Released	Units	Continuous Mode				Batch Mode			
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Barium/Lanthanum-140	Ci								
Cerium-141	Ci								
Total (above)	Ci					1.47E-04	3.55E-03	9.28E-04	1.41E-04
Unidentified (from total above)	Ci								
Tritium									
Hydrogen-3	Ci	5.73E-02	0.00E+00	2.08E-02	2.53E-02	3.23E+02	1.50E+02	3.75E+01	2.25E+01
Dissolved And Entrained Gases									
Xenon-133	Ci					3.30E-03	8.45E-03		
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

2014

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of Waste	Units	12 Month Period	Est. total Error (%)
A – Spent Resins, Filter Sludge, Evaporator Bottoms, Etc.	m^3	2.75E+00	2.5E+01
	Ci	4.93E+01	2.5E+01
B – Dry Active Waste (DAW), Contaminated Equipment, Etc.	m^3	2.78E+02	2.5E+01
	Ci	1.75E-01	2.5E+01
C – Irradiated Components, Control Rods, Etc.	m^3	None	N/A
	Ci		
D – Other: Combined Packages	m^3	None	N/A
	Ci	None	N/A

Note: Estimated total error for solid waste shipped offsite not available.

TABLE 3 (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
2014

2. Estimate of Major Nuclide Composition By Type of Waste					
Isotope	**Unit**	**Type A**	**Type B**	**Type C**	**Type D**
Co-58	%	8.43	3.5		
Co-60	%	7.81	10.87		
Cr-51	%	6.02			
Cs-137	%		6.77		
Fe-55	%	5.49	14.61		
Mn-54	%	2.4	4.29		
Nb-95	%	7.99			
Ni-63	%	55.33	49.29		
Sb-125	%		1.12		
Zr-95	%	5.05			
Cs-134	%		2.67		
Be-7	%		3.80		
Total	%	98.5	96.9		

Note: Blank cells indicate nuclide composition not at significant levels.

TABLE 3 (Continued)
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
2014

# of Shipments	Mode of Transportation	Type of Container	Solidification Agent	Processing Destination
1	Sole Use Truck	High Integrity Containers (HICs)	None Used Onsite	Waste Control Specialists, Andrews, Texas
5	Sole Use Truck	Metal Containers	None Used Onsite	EnergySolutions, BC

B. IRRADIATED FUEL SHIPMENTS (Disposition)

# of Shipments	Mode of Transportation	Destination
None	N/A	N/A

TABLE 4A

Radiation Dose to Maximum Individual Receptor from Gaseous Effluents

First Quarter 2014

(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	2.59E-06	1.44E-06	2.01E-04	2.20E-04	3.02E-04	8.26E-08
NNE	2.17E-06	1.21E-06	1.68E-04	1.85E-04	2.53E-04	6.93E-08
NE	2.50E-06	1.39E-06	1.94E-04	2.13E-04	2.92E-04	7.98E-08
ENE	3.18E-06	1.77E-06	2.47E-04	2.70E-04	3.71E-04	1.01E-07
E	5.78E-06	3.21E-06	4.49E-04	4.92E-04	6.75E-04	1.85E-07
ESE	7.35E-06	4.09E-06	5.71E-04	6.26E-04	8.59E-04	3.75E-04
SE	4.45E-06	2.47E-06	3.45E-04	3.79E-04	5.20E-04	1.42E-07
SSE	1.83E-06	1.02E-06	1.42E-04	1.56E-04	2.14E-04	5.85E-08
S	3.20E-06	1.78E-06	2.49E-04	2.73E-04	3.75E-04	1.02E-07
SSW	3.20E-06	1.78E-06	2.49E-04	2.73E-04	3.75E-04	1.02E-07
SW	3.20E-06	1.78E-06	2.49E-04	2.73E-04	3.75E-04	1.02E-07
WSW	3.42E-06	1.90E-06	2.66E-04	2.91E-04	3.99E-04	1.09E-07
W	2.18E-06	1.21E-06	1.69E-04	1.85E-04	2.54E-04	6.95E-08
WNW	1.84E-07	1.02E-07	1.43E-05	1.57E-05	2.15E-05	5.87E-09
NW	6.03E-07	3.35E-07	4.68E-05	5.13E-05	7.04E-05	1.92E-08
NNW	1.88E-06	1.05E-06	1.46E-04	1.60E-04	2.20E-04	6.01E-08
MAX.	7.35E-06	4.09E-06	5.71E-04	6.26E-04	8.59E-04	3.75E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Second Quarter 2014
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	2.58E-05	4.96E-05	2.18E-03	2.92E-03	5.34E-03	1.04E-02
NNE	2.17E-05	4.16E-05	1.83E-03	2.45E-03	4.47E-03	8.74E-03
NE	2.50E-05	4.79E-05	2.11E-03	2.82E-03	5.15E-03	1.01E-02
ENE	3.17E-05	6.09E-05	2.68E-03	3.59E-03	6.55E-03	1.28E-02
E	5.77E-05	1.11E-04	4.87E-03	6.53E-03	1.19E-02	2.33E-02
ESE	7.34E-05	1.41E-04	6.20E-03	8.30E-03	1.52E-02	2.96E-02
SE	4.44E-05	8.53E-05	3.75E-03	5.02E-03	9.17E-03	1.79E-02
SSE	1.83E-05	3.51E-05	1.54E-03	2.07E-03	3.77E-03	7.38E-03
S	3.20E-05	6.15E-05	2.70E-03	3.62E-03	6.61E-03	1.29E-02
SSW	3.20E-05	6.15E-05	2.70E-03	3.62E-03	6.61E-03	1.29E-02
SW	3.20E-05	6.15E-05	2.70E-03	3.62E-03	6.61E-03	1.29E-02
WSW	3.41E-05	6.56E-05	2.88E-03	3.86E-03	7.05E-03	1.38E-02
W	2.17E-05	4.17E-05	1.84E-03	2.46E-03	4.49E-03	8.77E-03
WNW	1.84E-06	3.53E-06	1.55E-04	2.08E-04	3.79E-04	7.41E-04
NW	6.02E-06	1.16E-05	5.08E-04	6.81E-04	1.24E-03	2.43E-03
NNW	1.88E-05	3.61E-05	1.59E-03	2.13E-03	3.88E-03	7.59E-03
MAX.	7.34E-05	1.41E-04	6.20E-03	8.30E-03	1.52E-02	2.96E-02

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Third Quarter 2014
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	2.09E-06	1.70E-06	1.64E-04	1.80E-04	2.46E-04	1.08E-04
NNE	1.75E-06	1.42E-06	1.37E-04	1.50E-04	2.07E-04	9.01E-05
NE	2.02E-06	1.64E-06	1.58E-04	1.73E-04	2.38E-04	1.04E-04
ENE	2.57E-06	2.09E-06	2.01E-04	2.20E-04	3.02E-04	1.32E-04
E	4.67E-06	3.80E-06	3.66E-04	4.01E-04	5.50E-04	2.40E-04
ESE	5.94E-06	4.83E-06	4.65E-04	5.10E-04	7.00E-04	3.06E-04
SE	3.59E-06	2.92E-06	2.81E-04	3.09E-04	4.24E-04	1.85E-04
SSE	1.48E-06	1.20E-06	1.16E-04	1.27E-04	1.74E-04	7.61E-05
S	2.59E-06	2.11E-06	2.03E-04	2.22E-04	3.05E-04	1.33E-04
SSW	2.59E-06	2.11E-06	2.03E-04	2.22E-04	3.05E-04	1.33E-04
SW	2.59E-06	2.11E-06	2.03E-04	2.22E-04	3.05E-04	1.33E-04
WSW	2.76E-06	2.25E-06	2.16E-04	2.37E-04	3.26E-04	1.42E-04
W	1.76E-06	1.43E-06	1.38E-04	1.51E-04	2.07E-04	9.04E-05
WNW	1.49E-07	1.21E-07	1.16E-05	1.28E-05	1.75E-05	7.64E-06
NW	4.87E-07	3.96E-07	3.81E-05	4.18E-05	5.74E-05	2.51E-05
NNW	1.52E-06	1.24E-06	1.19E-04	1.31E-04	1.79E-04	7.82E-05
MAX.	5.94E-06	4.83E-06	4.65E-04	5.10E-04	7.00E-04	3.06E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4A (Continued)
Radiation Dose to Maximum Individual Receptor from Gaseous Effluents
Fourth Quarter 2014
(Units In milliRem)

	All Gamma Air	All Beta Air	Adult THYRD	Teen THYRD	Child THYRD	Infant THYRD
N	2.16E-06	1.91E-06	1.42E-04	1.55E-04	2.13E-04	9.30E-05
NNE	1.81E-06	1.60E-06	1.19E-04	1.30E-04	1.78E-04	7.79E-05
NE	2.08E-06	1.85E-06	1.37E-04	1.50E-04	2.06E-04	8.98E-05
ENE	2.65E-06	2.35E-06	1.74E-04	1.90E-04	2.61E-04	1.14E-04
E	4.82E-06	4.28E-06	3.16E-04	3.46E-04	4.75E-04	2.08E-04
ESE	6.13E-06	5.44E-06	4.02E-04	4.40E-04	6.05E-04	2.64E-04
SE	3.71E-06	3.29E-06	2.43E-04	2.66E-04	3.66E-04	1.60E-04
SSE	1.53E-06	1.35E-06	1.00E-04	1.10E-04	1.51E-04	6.58E-05
S	2.67E-06	2.37E-06	1.75E-04	1.92E-04	2.64E-04	1.15E-04
SSW	2.67E-06	2.37E-06	1.75E-04	1.92E-04	2.64E-04	1.15E-04
SW	2.67E-06	2.37E-06	1.75E-04	1.92E-04	2.64E-04	1.15E-04
WSW	2.85E-06	2.53E-06	1.87E-04	2.05E-04	2.81E-04	1.23E-04
W	1.81E-06	1.61E-06	1.19E-04	1.30E-04	1.79E-04	7.82E-05
WNW	1.53E-07	1.36E-07	1.01E-05	1.10E-05	1.51E-05	6.60E-06
NW	5.03E-07	4.46E-07	3.30E-05	3.61E-05	4.96E-05	2.17E-05
NNW	1.57E-06	1.39E-06	1.03E-04	1.13E-04	1.55E-04	6.76E-05
MAX.	6.13E-06	5.44E-06	4.02E-04	4.40E-04	6.05E-04	2.64E-04

Note: Shaded regions indicate areas over Lake Ontario.

TABLE 4B
Radiation Dose To Maximum Individual Receptor
From Liquid Effluents for 2014
(Units in milliRem)

	Adult	Teen	Child	Infant
First Quarter				
T. Body	2.92E-03	2.21E-03	2.20E-03	6.29E-04
GI-LLI	2.93E-03	2.23E-03	2.20E-03	6.29E-04
Thyroid	2.92E-03	2.22E-03	2.20E-03	6.27E-04
Second Quarter				
T. Body	5.26E-03	4.04E-03	4.01E-03	1.10E-03
GI-LLI	6.49E-03	4.81E-03	4.16E-03	1.10E-03
Thyroid	5.11E-03	3.88E-03	3.85E-03	1.01E-03
Third Quarter				
T. Body	2.51E-03	1.41E-03	6.06E-04	2.82E-05
GI-LLI	2.21E-04	1.66E-04	1.22E-04	2.82E-05
Thyroid	1.31E-04	9.94E-05	9.86E-05	2.82E-05
Fourth Quarter				
T. Body	8.49E-05	6.39E-05	6.33E-05	1.81E-05
GI-LLI	8.55E-05	6.48E-05	6.35E-05	1.81E-05
Thyroid	8.39E-05	6.37E-05	6.31E-05	1.81E-05

TABLE 5
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW01: Warehouse Access Road (Control)	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW03: Screenhouse West, South Well	01/24/2014	*
	02/25/2014	*
	03/11/2014	*
	04/18/2014	*
	05/14/2014	*
	06/27/2014	*
	07/24/2014	*
	08/23/2014	*
	09/21/2014	*
	10/31/2014	*
	11/14/2014	*
	12/10/2014	*
GW04: Screenhouse West, North Well	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW05: Screenhouse East, South (15.5')	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*

TABLE 5 (Continued)
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW06: Screenhouse East, Middle (20.0')	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW07: Screenhouse East, North (24.0')	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW08: All Volatile Treatment Building	01/24/2014	*
	02/25/2014	*
	03/11/2014	*
	04/18/2014	*
	05/14/2014	*
	06/27/2014	*
	07/24/2014	*
	08/23/2014	*
	09/21/2014	*
	10/31/2014	*
	11/14/2014	*
	12/10/2014	*
GW10: Technical Support Center, South	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*

TABLE 5 (Continued)
Groundwater Monitoring Wells

Location	Sample Date	Tritium (uCi/ml)
GW11: Southeast of Contaminated Service Building (CSB)	02/28/2014	*
	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW12: West of Orchard Access Road	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW13: North of Independent Spent Fuel Storage Installation (ISFSI)	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW14: South of Canister Preparation Building	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW15: West of Manor House	03/11/2014	*
	06/27/2014	*
	09/21/2014	*
	12/10/2014	*
GW16: Southeast of Manor House	03/11/2014	*
	06/27/2014	*
	09/21/2014	Dry – no sample
	12/10/2014	Dry – no sample

* - Activity not detected (Tritium)

TABLE 6
Offsite Dose Due to Carbon-14 in Gaseous and Liquid Effluents

MAXIMUM DOSE VALUES DUE TO C-14 IN GASEOUS EFFLUENTS IN 2014		
Organ	**Age Group**	**mRem/yr**
NRC Reg. Guide 1.109, Annual Bone Dose	Child	1.94E-02
NRC Reg. Guide 1.109, Annual Total Body/Organ Dose	Child	3.86E-03

MAXIMUM DOSE VALUES DUE TO C-14 IN LIQUID EFFLUENTS IN 2014		
Organ	**Age**	**mRem/yr**
NRC Reg. Guide 1.109, Annual Bone Dose	Child	5.84E-05
NRC Reg. Guide 1.109, Annual Total Body/Organ Dose	Child	1.17E-05