State of Illinois
Illinois Emergency Management Agency

2014 Annual Survey Report

IEMA

EMERGENCY MANAGEMENT EMAP Accredited ACCREDITATION PROGRAM

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PREFACE

The Illinois Low-Level Radioactive Waste Management Act mandates an annual survey of all low-level radioactive waste (LLRW) generators in Illinois. The Illinois Emergency Management Agency (IEMA) requires all LLRW generators to complete an online questionnaire and provide:

1. The types and quantities of LLRW that was either shipped for disposal or stored on-site;
2. How LLRW is being managed (i.e. treatment); and
3. What management alternatives a generator might use in the future.

This is the 31st report based on the response to those surveys.

Please note that where possible International System of Units (SI) is included in parentheses behind English units. Annual Reports are available for the years 1984 through 2014. Comments on this report and suggestions for preparing future reports are welcome and should be addressed to:

LLRW and Decommissioning Unit
Bureau of Radiation Safety
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, IL 62704 or:
e-mail to: www.ema.LLRWAnnualSurvey@illinois.gov

Additional information about LLRW is also available by writing to the address above and through IEMA's website: http://iema.illinois.gov/iema/publications/publications.asp.

CONVERSION FACTORS

Multiply English Unit	by	To obtain SI unit
Cubic Foot (ft^3)	0.02832	Cubic Meter (m^3)
Millicurie (mCi)	37	Megabecquerel (MBq)
Curie (Ci)	37	Gigabecquerel (GBq)

1 millicurie = 0.001 curie
1 megaBecquerels = 1,000,000 Becquerels
1 gigaBecquerels = 1,000,000,000 Becquerels
1 teraBecquerels = 1,000,000,000,000 Becquerels

DATA REPORTING

Data is reported to the Agency in cubic feet for volume and millicuries (mCi) for activity. For purposes of this report, the data is presented to one decimal place. Some generators produce very small amounts of radioactivity. In those cases, the activity may be reported as less than 0.1 mCi. Some generators produce large amounts of radioactivity. In those cases the data may be presented in curies (Ci). One curie is equal to 1,000 mCi. A value will be reported as 0 only if it is known to be 0.

The data is then converted into SI units. The SI unit for volume is the cubic meter which is equivalent to 35.3 cubic feet. When converting from cubic feet to cubic meters, anything less than 3.5 cubic feet will be shown as less than 0.1 cubic meters.

The SI unit for radioactivity is the Becquerel (Bq). A Becquerel is a very small unit. One millicurie is equal to 37,000,000 Bq or 37 megaBecquerels (MBq) using the prefix "mega" or "M" to represent 1,000,000. One curie is equal to 37,000 MBq or 37 gigaBecquerels (GBq) using the prefix "giga" or "G" to represent 1,000,000,000. For those generators who produce large amounts of radioactivity the activity may be shown in teraBecquerels (TBq) using the prefix "tera" or "T" to represent 1,000,000,000,000. The reader will need to pay attention to the column headers for activity since the units may change from one table to another. This is done because of space limitation in the tables.

During the conversion process, values that are reported as less than 0.1 use the actual value for the calculation. That is why the reader may see different SI unit values for data reported as less than 0.1. When summing data in the tables, actual values that are reported or calculated in the conversion to SI units are included in the total. Therefore, some totals may not add correctly due to rounding.

Introduction

The Illinois Low-Level Radioactive Waste Management Act (Management Act) requires all low-level radioactive waste (LLRW) generators to submit annual reports detailing classes, quantities and types of LLRW possessed, generated, treated or shipped for treatment, storage or disposal. This report contains a summary of the generator's responses to the 2014 annual survey. LLRW will be referred to in terms of volume, radioactivity and half-life.

Low-level radioactive waste is defined in the Management Act as:

> "Low-level radioactive waste" or "waste" means radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel or byproduct material as defined in Section 11e(2) of the Atomic Energy Act of 1954 (42 U.S.C. 2015).

Generators of LLRW include nuclear power stations, hospitals, universities and industrial companies.

On-Site Waste Management

Some LLRW generators perform on-site waste management. Techniques include decontamination, volume reduction, decay in storage (for short half-life radionuclides), and disposal in the sanitary drain (for select radionuclides at low concentrations). The results of the on-site management is a reduced volume of waste requiring off-site treatment or disposal, a more stable waste form and a reduction in waste management related expenses.

Off-Site Waste Management

The majority of waste treatment occurs at off-site waste management facilities. Small waste generators typically use the services of a waste broker who collects their waste and takes it either to their facility for consolidation with other generators' waste or to a facility for treatment or disposal. Large generators usually have sufficient volumes of waste to make shipments directly to a treatment or disposal facility.

Off-site treatment varies depending on the waste type. Determining the appropriate treatment is a balance between the cost of processing and the cost of disposal. For components or other re-useable items, the salvage value of the item is also considered. There are several treatment facilities that offer a variety of waste processing services, including:

- Segregation and sorting
- Compaction
- Incineration
- Decontamination
- Thermal destruction
- Encapsulation
- Solidification and stabilization
- Metal melt
- Size reduction
- Repackaging

Waste processing results in a more stable waste form and a reduced volume of waste requiring disposal.

Available Disposal Capacity

Illinois generators can dispose of waste at the Energy*Solutions*' Clive, UT facility which accepts most Class A waste types. Illinois generators also have the option for disposal of LLRW, including Class B and C waste, at the Waste Control Specialists (WCS) facility in Andrews County, TX. Waste considered to be naturally occurring radioactive material (NORM) can be disposed at the US Ecology Richland, WA disposal facility or at several US EPA RCRA Subtitle C landfills (NORM material with lower concentrations).

Annual Surveys

In compliance with the Management Act, the Illinois Emergency Management Agency (IEMA) conducts an annual survey of the LLRW generators located in Illinois and any broker or processor that handles Illinois LLRW within or outside of the state. Each generator provides IEMA with information by completing the generator's Annual Survey about the types, quantities and activity of LLRW generated, stored, treated and disposed of and future LLRW shipment projections. Brokers and processors provide information regarding any and all Illinois waste received, treated, processed and shipped for disposal by completing the Brokers' and Processors' Annual Survey.

LLRW Tracking System

IEMA operates a system to administratively track shipments of LLRW that have a point of origination or destination in the state of Illinois. Persons who ship LLRW into, out of or within the state must obtain a permit from IEMA and report shipment information electronically to the Tracking System. Brokers can provide the Electronic Data Transmission (EDT) files on behalf of their generator customers. IEMA provides the information collected by the Tracking System back to the generators in the form of completed annual survey tables for generator verification.

Conclusion and Observations from the 2014 Annual Survey

Illinois LLRW generation in 2014 continued to demonstrate the typical variation in year to year production. The waste volume and activity both decreased from 2013. The number of generators decreased from 2013 to 2014 by three. In fact, IEMA has seen a 9% reduction in the number of generators since 2008, which is consistent with the decline observed since 2000. We attribute the reduction to improved site management of low-level radioactive waste that results in a reduction of volume.

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Chapter Two

2014 Annual Survey Results

There were 416 LLRW generators in Illinois during 2014, a decrease of three or 0.7% decrease from the previous year. Table 1 provides a summary of the number of generators in each of the categories. Figure 1 provides a graphical representation of the distribution of generators for the last seven years. A description of each of the generator categories is provided below. The category with the largest number of generators is Medical with 296. LLRW generators are distributed throughout Illinois with the largest concentration in the Chicago metropolitan region.

Table 1 – Illinois LLRW Generator Survey Response by Generator Category 2008 – 2014

Generator Category	2008	2009	2010	2011	2012	2013	2014
Academic	35	33	33	29	28	30	31
Fuel Cycle	2	2	2	2	2	2	2
Governmental	19	18	15	15	15	16	16
Industrial	66	66	65	58	57	62	64
Medical	327	329	319	316	313	302	296
Reactor	7	7	7	7	7	7	7
Total	456	455	441	427	422	419	416

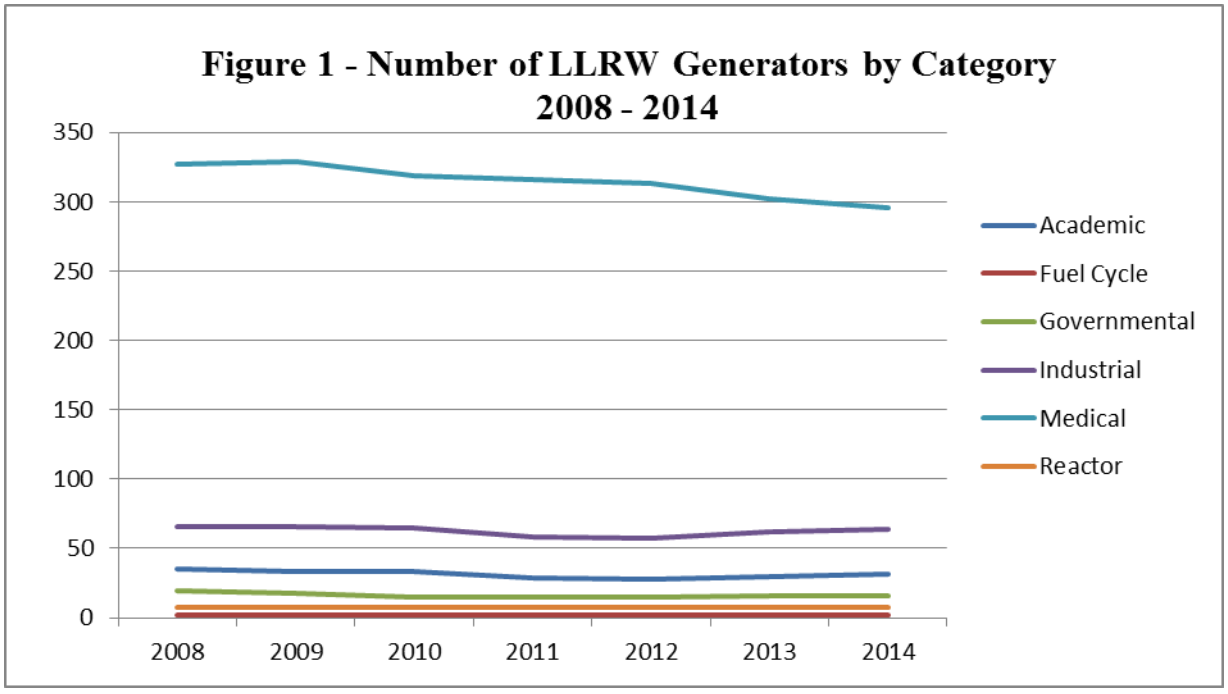
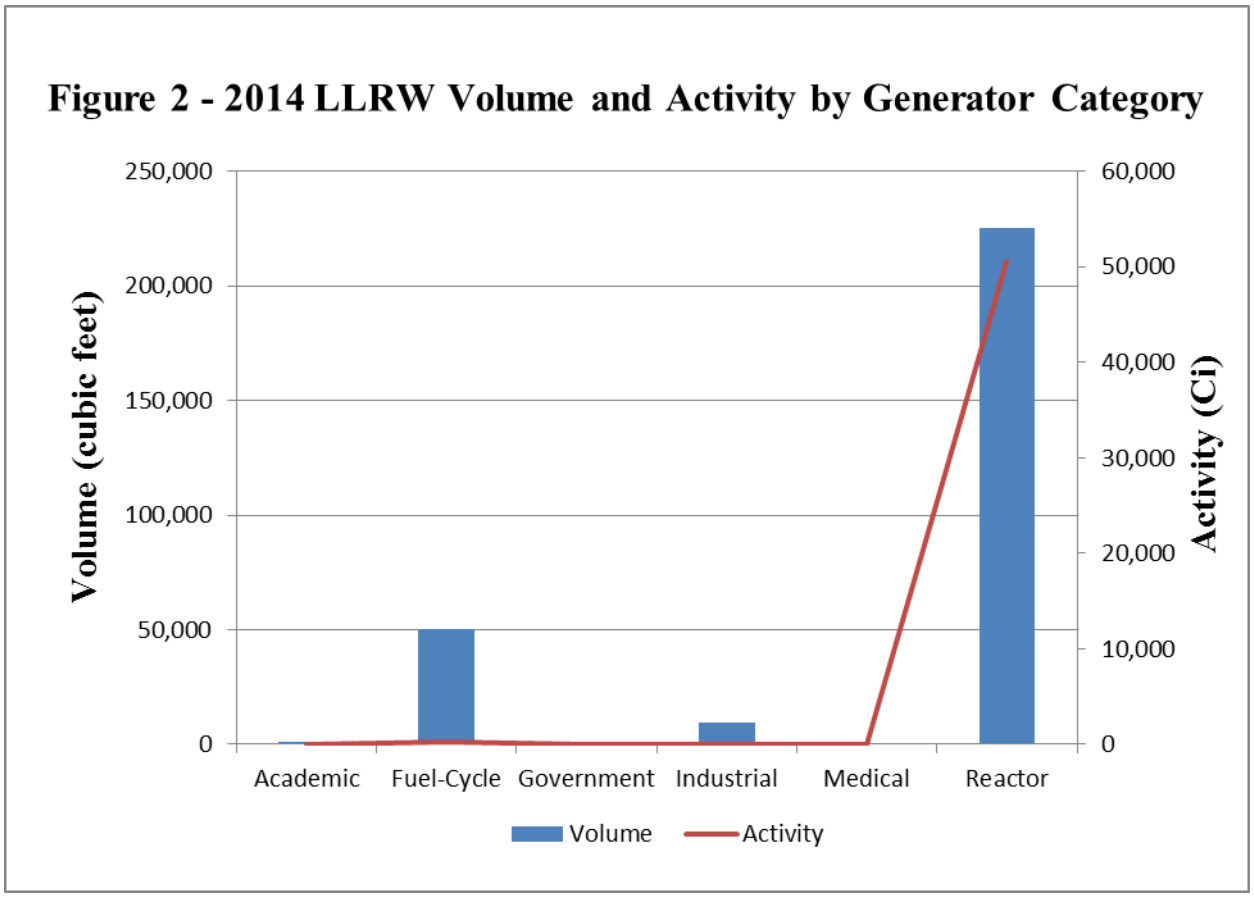


Table 2 provides a summary of the volume and activity of LLRW produced by each generator category. Figure 2 shows a graphical representation of the waste volume and activity distribution between the generator categories.

Table 2 – 2014 Volume and Activity by Generator Category

Generator Category	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
Academic	939.3	26.6	354.8	13,129.1
Fuel-Cycle	50,270.0	1,423.6	223,505.4	8,269,702.0
Governmental	39.82	1.1	3.9	144.7
Industrial	9,485.9	268.6	5,897.1	218,190.9
Medical	32.8	1.0	16.8	621.9
Reactor	225,254.2	6,379.2	50,637,372.1	1,873,582,769.0
Totals	286,022.0	8,100.1	50,867,715.1	1,882,084,557.6

Note – Totals may not add due to rounding.



The following pages detail the responses received to the 2014 Annual Survey. The responses have been consolidated by generator category.

Academic Category –

- Includes LLRW generated at high schools, colleges, universities and associated research facilities.
- 10 of 31 generators shipped in 2014

A decrease in waste volume and activity from the previous year was reported. This represents a 59.5% decrease in volume and also a 65.1% decrease in activity.

Table 3 – 2008 – 2014 Academic Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	35	33	33	28	28	30	31
# of shippers	12	11	10	9	8	12	10
Volume (ft^3)	2,380	911	703	2,579	3,679	2,316	939
Volume (m^3)	27	26	20	73	104	66	27
Activity (mCi)	1,003	2,528	629	881	4,901	1,018	355
Activity (MBq)	37,111	93,526	23,263	32,605	181,354	37,657	13,129

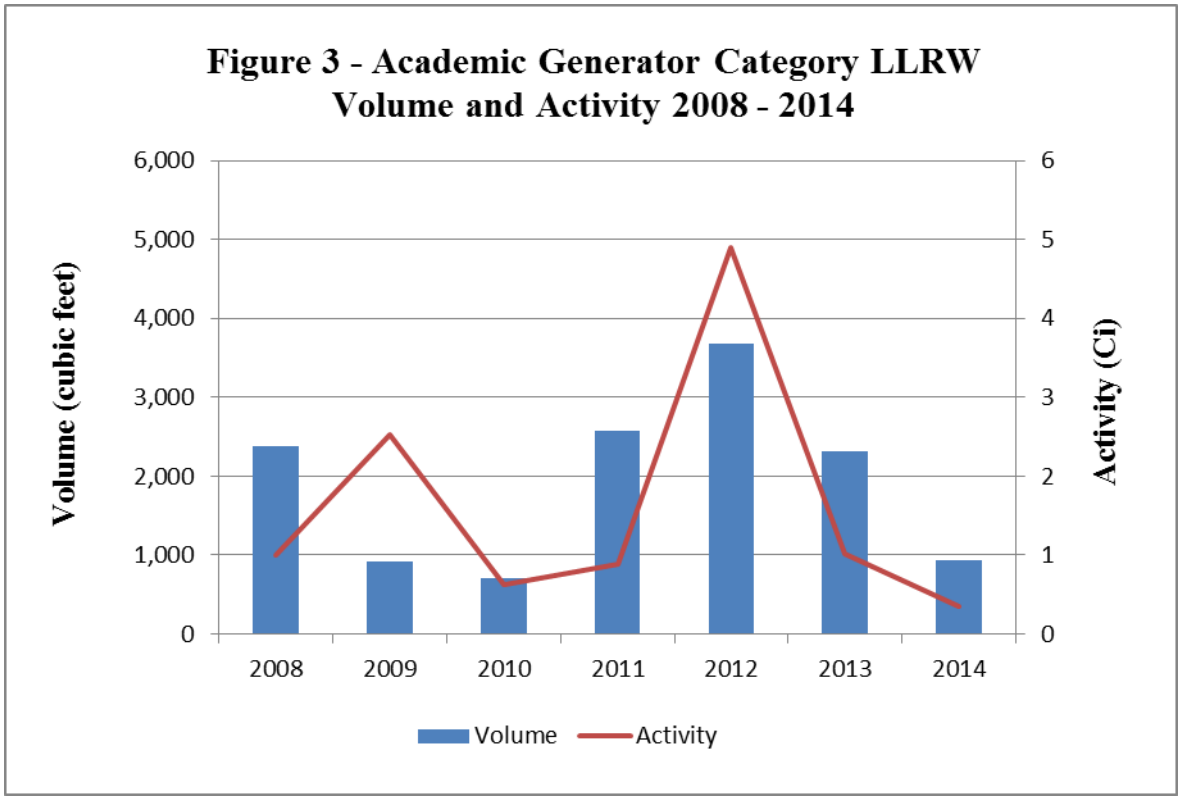


Table 4 – 2014 Academic Generators Shipping LLRW for Processing or Disposal

Academic Generator	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
Buffalo Grove High School	0.7	0.0	9.7	359.2
Northwestern University	187.5	5.3	41.1	1,520.0
Olivet Nazarene University	0.7	0.1	0.0	0.0
Rosalind Franklin University of Medical Science	51.4	1.5	60.2	2,226.7
SIU at Carbondale	67.5	1.9	3.8	139.1
Southern Illinois University	15.6	0.4	3.4	123.9
The University of Chicago	137.2	3.9	108.3	4,006.4
U of I at Urbana-Champaign	156.5	4.4	62.0	2,295.5
University of Illinois at Chicago	321.6	9.1	66.4	2,458.3
Wilbur Wright College	0.7	0.0	0.0	0.0
Total	939.4	26.6	354.8	13,129.1

Note – Totals may not add due to rounding.

Fuel Cycle Category

- Includes LLRW generators whose operations are part of the nuclear fuel cycle
- A significant increase in waste volume and in activity generation from the previous year. Honeywell International was not operational for part of 2013; therefore the difference in volume and activity is significantly higher for 2014.

Table 5 – 2008 – 2014 Fuel Cycle Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	2	2	2	2	2	2	2
# of shippers	1	1	1	2	1	1	2
Volume (ft^3)	210,426	255,614	187,167	122,200	34,633	13,675	50,270
Volume (m^3)	5,959	6,389	5,301	3,461	981	387	1,423
Activity (mCi)	2,248	5,175	8,648	2,245	852	3,480	223.505
Activity (MBq)	83,176	191,465	319,969	83,045	31,541	128,773	8,269,702

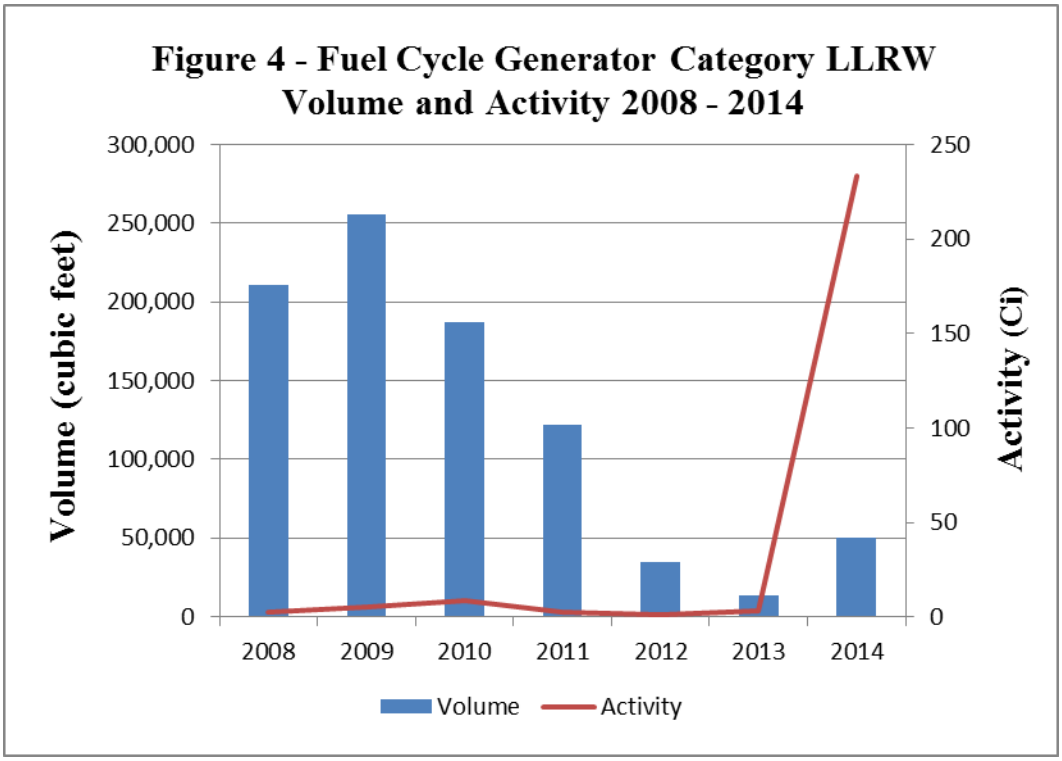


Table 6 – 2014 Fuel Cycle Generators Shipping LLRW for Processing or Disposal

Fuel Cycle Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
GE Hitachi Nuclear Energy	150	4	221,517	8,196,146
Honeywell International Inc.	50,120	1,419	1,988	73,556
Total	50,270	1,423	223,505	8,269,702

Governmental Category

- Includes LLRW generated by city, state and federal governmental entities (including VA hospitals)
- 3 of 16 generators shipped in 2014
- A significant decreases in volume of 94.1% and a 99.8% decrease in activity from the previous year were also reported This is due to the fact that one Veterans Administration hospital did not report in 2014 and there is variance in radium residuals that are sent for disposal or processing from year to year.

Table 7 – 2008 – 2014 Governmental Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	19	18	15	15	15	16	16
# of shippers	4	2	1	2	4	4	3
Volume (ft^3)	191	30	620	27	153	679	40
Volume (m^3)	6	1	18	1	4	19	1.1
Activity (mCi)	335	1	644	<1	4,352	2,959	3.9
Activity (MBq)	12,395	39	23,823	8	161,024	109,487	145

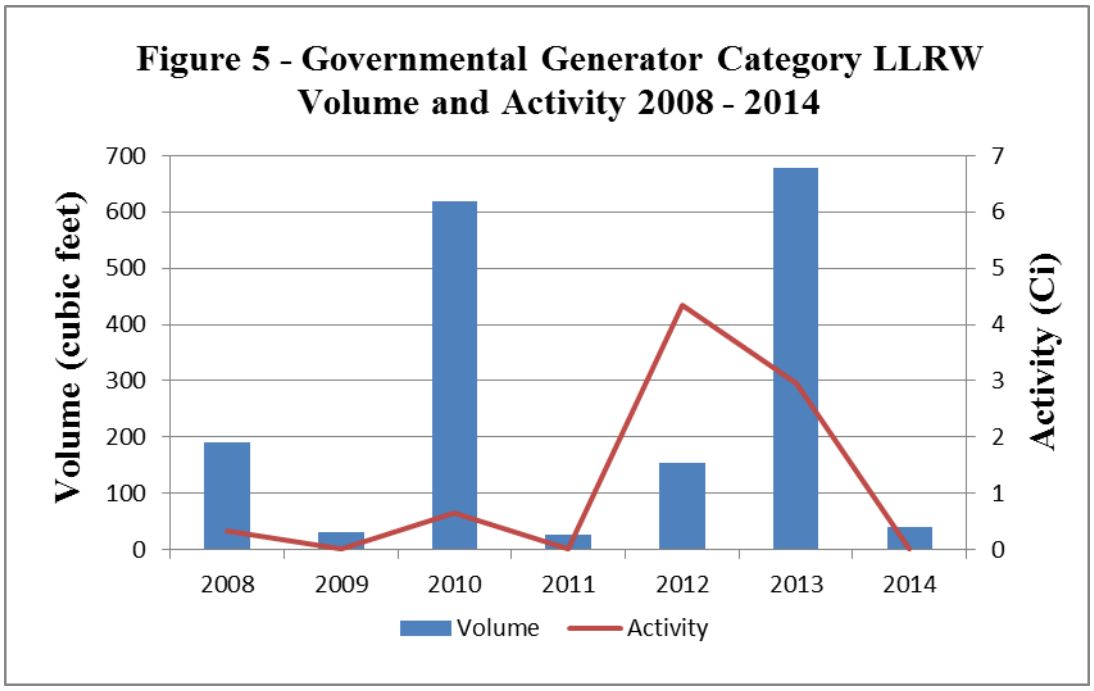


Table 8 – 2014 Governmental Generators Shipping LLRW for Processing or Disposal

Governmental Generator	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
American Water Works	2.0	0.1	0.0	0.0
Jesse Brown VA Medical Center	14.1	0.4	1.3	46.3
Village of Bryant Illinois	23.7	0.7	2.6	98.4
Total	39.8	1.1	3.9	145.0

Note – Totals may not add due to rounding.

Industrial Category

- Includes LLRW generated by private entities that provide products or services to the private and public sectors
- 12 of 64 generators shipped in 2014
- An increase in waste volume of 12.6% and a slight decrease in activity of 9.2% from the previous year was reported. This is due in part to four less generators shipping for this reporting period.

Table 9 – 2008 – 2014 Industrial Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	66	66	65	58	57	62	64
# of shippers	17	17	15	13	9	16	12
Volume (ft^3)	10,072	24,865	11,295	67,298	11,184	8,424	9,486
Volume (m^3)	285	704	320	1,906	317	239	269
Activity (Ci)	46	41	20	112	156	65	59
Activity (GBq)	1,705	1,515	738	4,153	5,803	2,420	2,182

Please note the units for activity are in Curies and gigaBecquerels.
1 Ci = 1,000 mCi; 1 GBq = 1,000 MBq

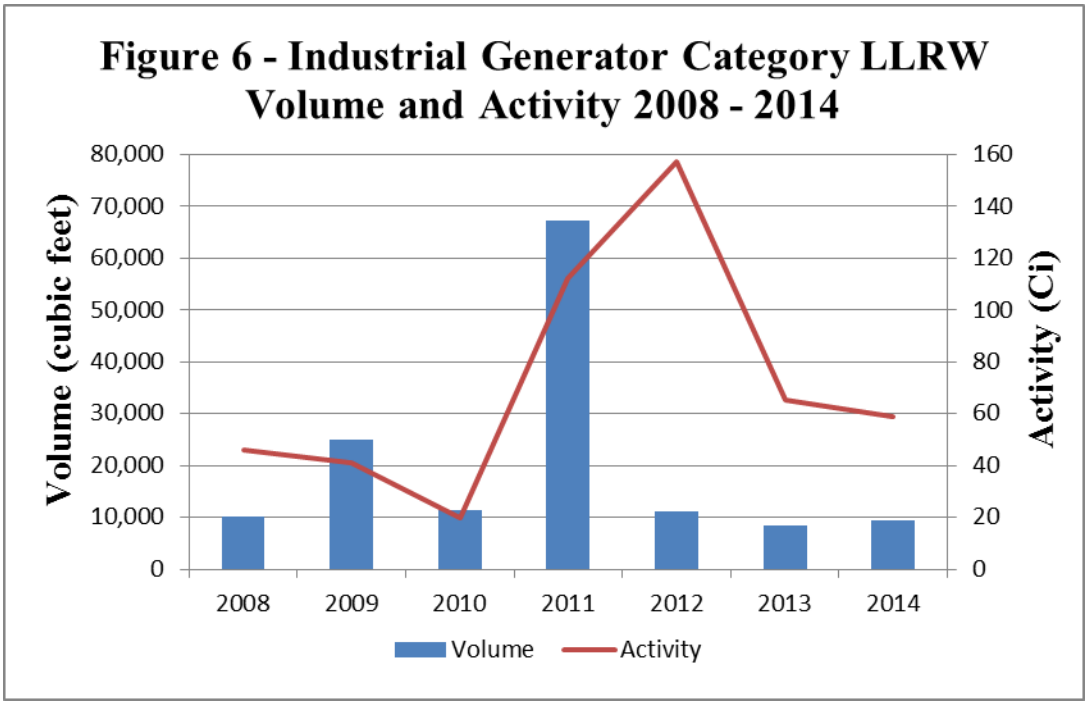


Table 10 – 2014 Industrial Generators Shipping LLRW for Processing or Disposal

Industrial Generator	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
AbbVie, Inc.	389.5	11.0	5,446.0	201,502.7
APL Engineered Materials, Inc.	7.5	0.2	0.0	0.4
Gas Technology Institute	9.2	0.3	0.1	3.7
L'Oreal USA Products, Inc.	0.7	0.0	0.0	0.4
PETNET Solutions, Inc.	11.2	0.3	17.6	650.8
Scrap Metal Services, LLC	1.3	0.0	5.0	185
Siemen's Medical Solutions USA, Inc	4.0	0.1	233.7	8,646.4
Sims Metal Management	34.5	1.0	11.7	432.9
Standard Aero	0.7	0.0	81	2,997
Stericycle, Inc.	1.3	0.0	1.1	40.7
Unitech Services Group, Inc.	3.650	103.4	16.8	622.7
Water Remediation Technology, LLC	5,376	152.2	84	3,108
Total	9,485.8	268.6	5,897.0	218,190.9

Note – Totals may not add due to rounding.

Medical Category

- Includes LLRW generated by hospitals, medical centers, clinics, laboratories and private medical offices
- 3 of the 296 medical generators shipped waste during 2014
- The majority of medical generators don't generate waste that requires offsite management
- The waste volume and activity decreased significantly. There was a 74% decrease in volume and a 99% decrease in activity.

Table 11 – 2008 – 2014 Medical Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	327	329	319	316	313	302	296
# of shippers	16	8	7	9	7	7	3
Volume (ft^3)	217	226	155	397	120	127	33
Volume (m^3)	5	6	4	11	3	4	1.0
Activity (mCi)	4,530	62	50	605	122	1,773	17
Activity (MBq)	167,610	2,296	1,854	22,377	4,500	65,608	622

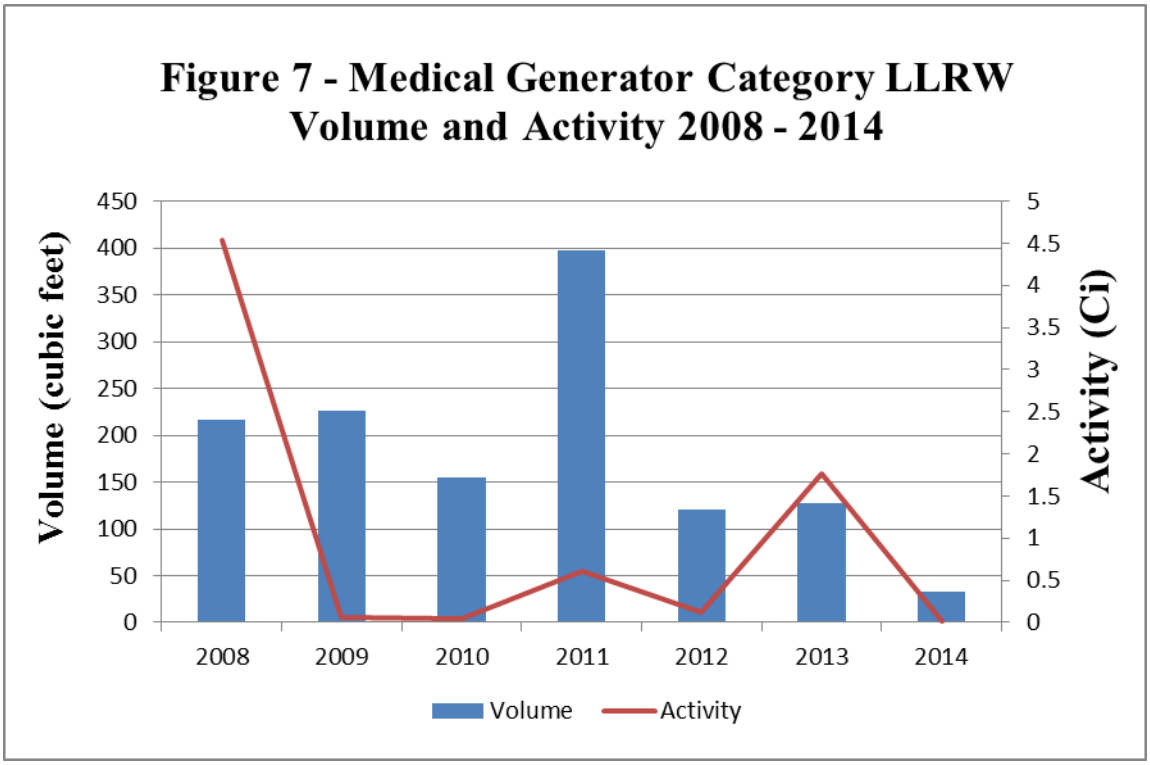


Table 12 – 2018 Medical Generators Shipping LLRW for Processing or Disposal

Medical Generator	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
Children's Hospital of Chicago	12	0.3	10	370
SIU School of Dental Medicine	16.8	0.5	0.0	1.1
Valent Biosciences Corporation	4	0.1	6.8	250
Total	32.8	1.0	16.8	622

Note – Totals may not add due to rounding.

Reactor Category

- Includes LLRW generated at the nuclear power stations
- All 7 generators shipped waste in 2014
- The waste volume decrease by 32% and activity increased by 1421.1% in 2014
- Waste volume and activities will vary substantially from year to year depending on the number of stations conducting refueling outages or other maintenance activities
- The Zion Station is being decommissioned and producing large volumes of low activity waste

Table 13 – 2008 – 2014 Reactor Generator Shipment Summary

Year	2008	2009	2010	2011	2012	2013	2014
# of generators	7	7	7	7	7	7	7
# of shippers	7	7	7	7	7	7	7
Volume (ft^3)	240,475	226,885	270,393	322,928	348,055	331,850	225,254
Volume (m^3)	6,810	6,425	7,658	9,429	9,857	9,398	6,379
Activity (Ci)	21,846	1,261	1,911	1,363	4,248	3,329	50,637
Activity (TBq)	808	47	71	50	157	123	1,874

Please note the units for activity are in Curies and teraBecquerels.
1 Ci = 1,000 mCi; 1 TBq = 1,000 GBq = 1,000,000 MBq

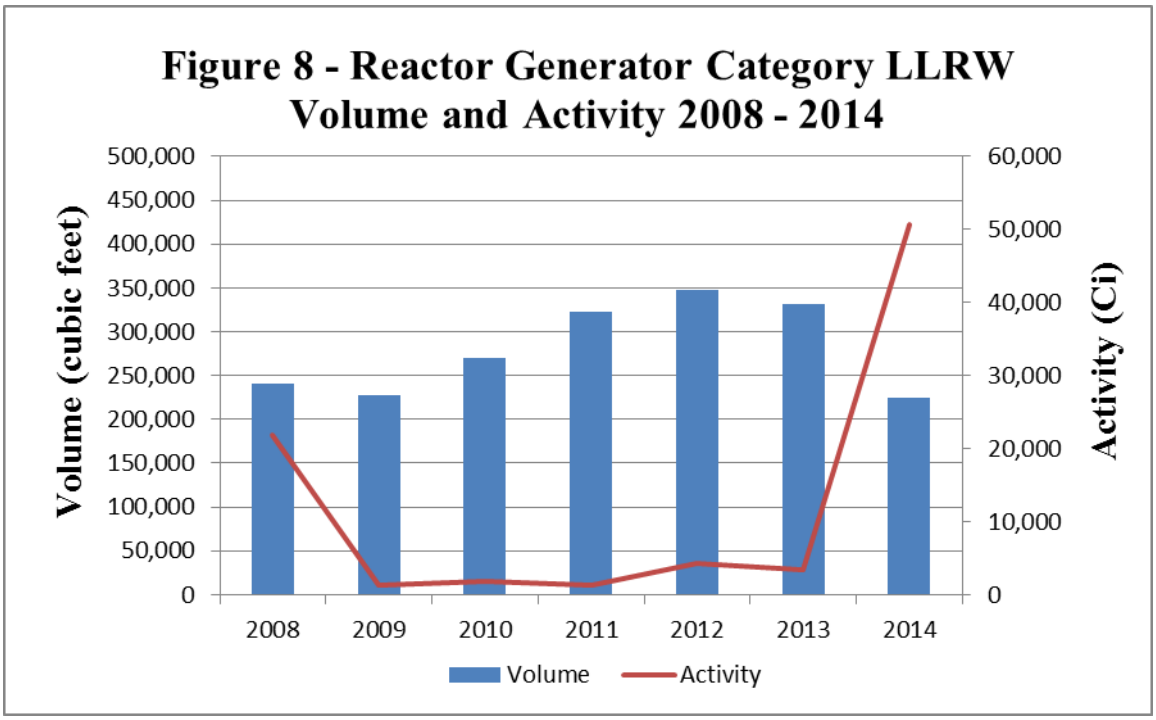


Table 14 – 2014 Reactor Generators Shipping LLRW for Processing or Disposal

Reactor Generator	Volume (ft^3)	(m^3)	Activity (mCi)	(MBq)
Braidwood	30,288.5	857.8	22,220.6	822,162.6
Byron	25,032.1	708.9	900,750.9	33,327,784.4
Clinton	8,155	230.9	543,778.4	20,119,800.8
Dresden	29,215.1	827.3	160,000.0	5,920,000.0
LaSalle	43,571.4	1,233.9	13,416.9	496,423.8
Quad Cities	29,076.4	823.4	472,683.2	17,489,278.4
Zion Station	59,915.8	1,696.8	48,524,522.1	1,795,407,319
Total	225,254.2	6,379.2	50,637,372.1	1,872,582,769

Note – Totals may not add due to rounding.

Volume and Classes of LLRW Shipped Directly to Disposal Facilities, Brokers and Processors

The U.S. Nuclear Regulatory Commission (NRC) established a waste classification system (10 CFR 61) that is incorporated and defined in 32 Illinois Administrative Code 340.1052. These regulations define three classes of LLRW based on the radionuclide content and concentration: Class A, Class B and Class C. The greater the hazard, the greater the level of protection required for disposal. Waste that is classified as greater than Class C (GTCC) is not generally acceptable for land disposal and is the responsibility of the federal government.

Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in Section 340.1055(a). If Class A waste also meets the stability requirements set forth in Section 340.1055(b), it is not necessary to segregate the waste for disposal.

Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability (as defined in 32Ill.Adm. Code 601.20) after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in Section 340.1055.

Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability, but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in Section 340.1055.

Table 15 – Distribution by Class of LLRW Shipped by Generator Category in 2014

Generator Category	Class A Volume (ft^3)	Class A Volume (m^3)	Class B Volume (ft^3)	Class B Volume (m^3)	Class C Volume (ft^3)	Class C Volume (m^3)	Total Category Volume (ft^3)	Total Category Volume (m^3)
Academic	939.3	26.6	0.0	0.0	0.0	0.0	939.3	26.6
Fuel-Cycle	50,120	1,419.4	150.0	4.2	0.0	0.0	50,270	1,423.6
Governmental	39.8	1.1	0.0	0.0	0.0	0.0	39.8	1.1
Industrial	9,485.9	268.6	0.0	0.0	4.0	0.1	9,485.9	268.6
Medical	32.8	0.9	0.0	0.0	0.0	0.0	32.8	0.9
Reactor	224,083.5	6,346.0	535.7	15.2	635.1	17.1	225,254.2	6,379.2
Total	284,701.3	8,062.6	685.7	19.4	635.1	17.1	286,022.0	8100.0

Note – Totals may not add due to rounding.

As can be seen in Table 15 above, Class A, B and C waste was shipped for disposal or to a broker or processor. The volume of Class B and Class C waste that is sent for disposal will likely increase in the future due to expected future decommissioning of nuclear power plants. Disposal options are now available for Class B and Class C waste at the LLRW disposal facility in Texas, along with the development of new processing techniques to treat Class B and C wastes.

Specific Waste

The NRC and Illinois have deregulated certain wastes in which the concentration of hydrogen-3 (tritium), carbon-14, or iodine-125 is so low they do not pose a significant radiation threat to public health and safety. This type of waste is defined in 32 Illinois Administrative Code 340.1050 as 'specific waste' (liquid scintillation fluids and animal carcasses) and may be disposed of as non-radioactive waste. Some of these wastes contain non-radioactive hazardous materials, such as toxic chemicals, or consist of animal tissue that can become bio-hazardous as it decomposes. Most of these wastes are generated by university and medical research activities and are either diluted with sufficient volumes of water as defined in 32 Administrative Code 340.1050 and disposed of in the sanitary sewer, destroyed by incineration, or transferred to a hazardous waste disposal facility. In some cases, these wastes are shipped to LLRW disposal facilities despite their low radioactive content. In 2014, ten academic facilities, four governmental, six industrial facilities and sixteen medical facilities disposed of specific waste into the sanitary sewer.

LLRW Stored On-Site for Decay to Background Levels

One alternative Illinois generators have to shipping LLRW contaminated with short-lived radionuclides for disposal is to store the waste on-site until the radioactivity diminishes to levels that permit disposal as non-radioactive waste. Licensees may be authorized to store for decay

wastes with half-lives less than 120 days. However, depending upon the needs of the generator, authorization for extended periods is granted. LLRW in storage for decay is normally held for 10 half-lives, or until the radioactivity has diminished to background levels. The table below shows the radionuclides stored for decay by Illinois generators and the number of generators who stored waste for decay by generator category. Fuel-cycle and reactor generators do not store waste for decay.

Table 16 – Radionuclides Held for Decay in 2014

Radionuclide	Half-Life		Academic	Governmental	Industrial	Medical	Total
AC-225	10	Days	1				1
Ar-41	1.8	Hours			1		1
BA-139	83	Minutes	1				
Br-82	1.5	Days			1		1
C-11	20.3	Minutes				1	1
Cl-38	37.29	Minutes			1		1
Cr-51	27.7	Days			2	2	4
Cs-131	9.7	Days				1	1
Cs-138	33.4	Minutes			1		1
Cu-64	12.7	Hours	1				1
F-18	109.7	Minutes			4	38	42
Ga-67	3.3	Days			5	78	83
Ga-68	68.3	Minutes				1	1
I-123	13.2	Hours		2	4	109	115
I-125	60.1	Days	1			2	3
I-131	8	Days			6	77	83
I-133	20.8	Hours				1	1
I-135	6.68	Hours			1		1
In-111	2.8	Days		2	4	102	106
K-42	12.4	Hours			1		1
Lu-177	6.6	Days	1				1
Mn-56	2.58	Hours			1		1
Mo-99	66	Hours			2		2
N-13	9.97	Minutes				1	1
P-32	14.3	Days	3		2	2	7
PD-103	17	Days				4	4
Ra-222	38	Seconds				1	1
Ra-223	11.4	Days			1	22	23
S-35	87.4	Days	1			1	2
Sb-122	67	Hours			1		1
Sm-153	47	Hours			3	7	10
Sr-89	50.6	Days			4	5	9
Sr-91	9.67	Hours			1		1
Sr-92	2.71	Hours			1		1
Tc-96m	6	Hours			5		5
Tc-99m	6	Hours	1	3	1	247	252
Tl-201	73.1	Hours			1	133	134
Xe-123	2.14	Hours				1	1
Xe-133	5.2	Days		2	5	69	76
Y-90	64.1	Hours	1		4	14	13

Mixed Waste

LLRW that also meets the U.S. Environmental Protection Agency's criteria as hazardous waste is called "mixed waste." The US EPA uses a process to define hazardous waste, but simply stated a hazardous waste is a waste with properties that make it dangerous or capable of having a harmful effect on human health or the environment. Some mixed waste is treated based on the hazardous component only, such as the organic fluids that are generally used as a secondary fuel source. Other mixed waste is treated to eliminate or stabilize the hazard prior to disposal. Some mixed waste is treated and disposed using the U.S. EPA's mixed waste exemption where the hazardous component is not considered as long as the waste is being managed in accordance with the radioactive hazard.

Table 17 – Types of Mixed Waste Stored On-Site at the end of 2014

Waste Type	Volume (ft^3)	Volume (m^3)	Radionuclides
Metals			
Mercury	4.0	0.1	Co-60, Cs-134, Cs-137, Mn-54
Dioxane	73.8	2.1	U-Nat
Scintillation Fluids			
Benzene	4.0	0.1	C-14,H-3
Toluene	62.4	1.8	C-14,Fe-55,H-3,
Xylene	7.5	0.2	Co-60, Cs-134, Cs-137, Mn-54
Other	2.0	<0.1	Ra-226
Solvents & Other Organic Fluids Other	47.7	1.4	C-14, Co-57,Co-58, Co-60, Cs-134, Cs-137, H-3,Mn-54, Ni-63,
Alkaline Liquids	22.5	0.6	Co-60, Cs-134, Cs-137, Mn-54,UNAT
Other	30.9	0.9	Co-60, Cs-134, Cs-137, Fe-55,H-3, Mn-54,
Total	254.8	7.22	

Note-Tables may not add due to rounding.

Chapter Three

Waste Projections

The 2014 Annual Survey required the generators to project the amount of LLRW they expect to produce or possess between 2015 and 2021. This information is used by the Agency for determining the development timeframe for a regional disposal facility or the need for an interim storage facility. Past history has indicated that the non-reactor generators underestimate volumes and activities by three to four times what was actually generated and disposed.

The projections are presented in both English and SI units for volume and activity.

Table 18 – LLRW Volume Projections (ft^3)
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	468	321	325	328	329	326	319
Fuel Cycle	100	100	100	100	250	100	100
Governmental	35	4	5	4	4	4	4
Industrial	5,436	5,458	5,442	5,500	5,517	5,654	5,540
Medical	158	144	144	143	143	143	143
Reactor	389,608	1,184,159	284,060	440,485	102,060	99,159	90,386
Total	395,805	1,190,186	290,076	446,527	108,286	105,249	96,492

Note - Totals may not add due to rounding.

Table 19 – LLRW Volume Projections (m^3)
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	13.3	9.1	9.2	9.3	9.3	9.2	9.0
Fuel Cycle	2.8	2.8	2.8	2.8	7.0	2.8	2.8
Governmental	1.0	0.1	0.1	0.1	0.1	0.1	0.1
Industrial	153.9	154.6	154.1	154.8	155.8	156.2	156.9
Medical	4.5	4.1	4.1	4.0	4.0	4.0	4.0
Reactor	11,033.7	33,535.4	8,044.6	12,474.5	2,890.3	2,808.2	2,559.7
Total	11,209.2	33,706.1	8,214.9	12,645.6	3,066.6	2,980.7	2,732.7

Note – Totals may not add due to rounding.

Table 20 – LLRW Activity Projections (mCi)
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	284	139	144	147	149	141	133
Fuel Cycle	5	5	5	5	150,005	5	5
Governmental	1,003	1	1	1	1	1	1
Industrial	32,359	70,454	10,504	10,654	70,654	10,754	10,854
Medical	39	26	26	24	24	24	24
Reactor	10,106,300	5,467,700	5,458,200	5,602,500	5,455,200	5,554,700	5,597,700
Total	10,139,990	5,538,326	5,468,880	5,613,331	5,676,033	5,565,625	5,608,717

Table 21 – LLRW Activity Projections (MBq)
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	10,508	5,143	5,328	5,439	5,513	5,217	4,921
Fuel Cycle	185	185	185	185	550,1855	185	185
Governmental	37,111	37	37	37	37	37	37
Industrial	1,197,301	2,606,809	388,650	394,200	2,614,200	397,900	401,560
Medical	1,428	973	973	870	870	870	870
Reactor	419,794,600	335,227,400	334,875,900	335,035,000	334,764,900	241,506,400	
Total	442,966,258	337,499,940	338,342,578	336,105,447	338,360,782	242,596,753	

Note – Totals may not add due to rounding.

Mixed Waste Projections

The 2014 Annual Survey asked generators to project the volume and activity of mixed waste they thought they would produce between 2015 and 2021. The following tables provide a summary of the generators' projections. Tables are presented for volume and activity in both English and SI units.

Table 22 – Mixed Waste Volume Projections (ft^3) by Generator Category 2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	180	0	0	0	0	0	0
Fuel Cycle	81	81	81	15	81	81	81
Government	0	0	1	0	0	0	0
Industrial	126	136	146	156	166	176	182
Medical	3	0	0	0	0	0	0
Reactor	8	8	8	8	8	8	8
Total	399	225	236	178	255	265	271

Table 23 – Mixed Waste Volume Projections (m^3) by Generator Category 2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	5	0	0	0	0	0	0
Fuel Cycle	2	2	2	0	2	2	2
Government	0	0	0	0	0	0	0
Industrial	4	4	4	4	5	5	5
Medical	0	0	0	0	0	0	0
Reactor	0	0	0	0	0	0	0
Total	11	6	6	5	7	7	7

Note – Totals may not add due to rounding.

Table 24 – Mixed Waste Activity Projections (mCi) by Generator Category
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	30	0	0	0	0	0	0
Fuel Cycle	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0
Industrial	3,504	3,604	3,704	3,804	3,904	4,004	4,103
Medical	0	0	0	0	0	0	0
Reactor	4	4	4	4	4	4	4
Total	3,539	3,608	3,708	3,808	3,908	4,008	4,107

Note – Totals may not add due to rounding.

Table 25 – Mixed Waste Volume Projections (MBq) by Generator Category
2015 - 2021

Year	2015	2016	2017	2018	2019	2020	2021
Academic	1,111	0	0	0	0	0	0
Fuel Cycle	10	10	10	10	10	10	10
Government	0	0	0	0	0	0	0
Industrial	129,648	133,330	137,030	140,730	144,430	148,130	151,793
Medical	9	0	0	0	0	0	0
Reactor	148	148	148	148	148	148	148
Total	130,926	133,487	137,187	140,887	144,587	148,287	151,950

Note – Totals may not add due to rounding.