State of Illinois
Illinois Emergency Management Agency

2011 Annual Survey Report

IEMA

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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 a 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 28th 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 2011. Comments on this report and suggestions for preparing future reports are welcome and should be addressed to:

LLRW and Decommissioning Unit
Bureau of Environmental Radiation Safety
Illinois Emergency Management Agency
1035 Outer Park Drive
Springfield, IL 62704

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 1 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 1000 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.

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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 2011 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.

Onsite Waste Management

Some LLRW generators perform onsite 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 onsite management is a reduced volume of waste requiring offsite treatment or disposal, a more stable waste form and a reduction in waste management related expenses.

Offsite Waste Management

The majority of waste treatment occurs at offsite 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 generator's waste or to a facility for treatment or disposal. Large generators usually have sufficient volumes of waste to make shipment direct to a treatment or disposal facility.

Offsite 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

Disposal capacity became limited effective on July 1, 2008 when South Carolina no longer authorized importation for purposes of disposal at their Barnwell site. "Importation," for these purposes, means the acceptance at the regional disposal facility of any waste that was generated in any foreign country or any state or territory of the U.S. other than Connecticut, New Jersey, and South Carolina.

Illinois generators can dispose of waste at The Energy*Solutions*' Clive, UT facility which accepts most Class A waste types. 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). Currently there is no disposal facility for Class B and C waste generated in Illinois.

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 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 2011 Annual Survey

Illinois LLRW generation in 2011 continued to demonstrate the typical variation in year to year production. The waste volume increased slightly from 2010; however the activity decreased significantly from the previous year. The number of generators decreased from 2010 to 2011 with a decline of 14 generators which continues the decline since 2000.

In 2011 the large volume generators were a fuel cycle facility that performed major cleanup activities and the nuclear power stations (reactor generators).

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Chapter Two

2011 Annual Survey Results

There were 427 LLRW generators in Illinois during 2011, a decrease of 14 from the previous year. Table 1 provides a summary of the number of generators in each of the categories. A description of each of the generator categories is provided below. The category with the largest number of generators is Medical with 316. LLRW generators are distributed throughout Illinois with the largest concentration in the Chicago metropolitan region. Table 2 provides a summary of the volume and activity of LLRW produced by each generator category.

Table 1 – Illinois LLRW Generator Survey Response by Generator Category 2005 – 2011

Generator Category	2005	2006	2007	2008	2009	2010	2011
Academic	35	32	33	35	33	33	29
Fuel Cycle	2	2	2	2	2	2	2
Governmental	22	18	18	19	18	15	15
Industrial	74	81	71	66	66	65	58
Medical	311	318	326	327	329	319	316
Reactor	7	7	7	7	7	7	7
Total	451	458	457	456	455	441	427

Table 2 – 2011 Volume and Activity by Generator Category

Generator Category	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
Academic	2,578.6	73.0	881.2	32,605.1
Fuel-Cycle	122,200.0	3,460.7	2,244.5	83,045.4
Governmental	27.2	0.8	0.2	8.1
Industrial	67,297.6	1,905.9	112,233.6	4,152,643.2
Medical	396.7	11.2	604.8	22,377.3
Reactor	332,927.9	9,428.5	1,362,749.6	50,421,735.8
Totals	525,427.9	14,880.1	1,478,713.9	54,712,414.9

Note – Totals may not add due to rounding.

The following pages detail the responses received to the 2011 Annual Survey. The responses have been consolidated by generator category.

Academic Category –

- Includes LLRW generated at high schools, colleges, universities and associated research facilities.
- 9 of 29 generators shipped in 2011
- An increase in waste volume and activity from the previous year was reported.

Table 3 – 2005 – 2011 Academic Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	35	32	33	35	33	33	29
# of shippers	11	9	9	12	11	10	9
Volume (ft^3)	1,828	1,096	962	2,380	911	703	2,579
Volume (m^3)	52	31	28	67	26	20	73
Activity (mCi)	20,170	2,089	5,096	1,003	2,528	629	881
Activity (MBq)	746,290	77,293	188,552	37,111	93,526	23,263	32,605

Table 4 – 2011 Academic Generators Shipping LLRW for Processing or Disposal

Academic Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
ASTELLAS Research Institute of America	36.7	1.0	10.2	378.3
Augusta College	1.4	<0.1	<0.1	<0.1
IIT Research Institute	29.0	0.8	11.2	414.0
Northwestern University	98.5	2.8	2.9	107.6
SIU at Carbondale	97.8	2.8	17.7	654.0
The University of Chicago	1,009.5	28.6	218.3	8,078.2
U of I at Urbana-Champaign	1,110.6	31.5	581.1	21,502.4
U of I at Chicago	194.0	5.5	39.7	1,470.2
Western Illinois University	1.0	<0.1	<0.1	0.3
Total	2,578.6	73.0	881.2	32,605.1

Note – Totals may not add due to rounding.

Fuel Cycle Category

- Includes LLRW generators whose operations are part of the nuclear fuel cycle
- A decrease in waste volume from the previous year
- A decrease in activity generation from the previous year

Table 5 – 2005 – 2011 Fuel Cycle Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	2	2	2	2	2	2	2
# of shippers	1	2	1	1	2	2	1
Volume (ft^3)	36,576	468,831	37,391	210,426	255,614	187,167	122,200
Volume (m^3)	1,036	13,277	1,059	5,959	6,389	5,301	3,461
Activity (mCi)	273	80,203	400	2,248	5,175	8,648	2,245
Activity (MBq)	10,101	2,967,511	14,800	83,176	191,465	319,969	83,045

Table 6 – 2011 Fuel Cycle Generators Shipping LLRW for Processing or Disposal

Fuel Cycle Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
Honeywell International Inc.	122,200.0	3,460.7	2,244.5	83,045.4
Total	122,200.0	3,460.7	2,244.5	83,045.4

Governmental Category

- Includes LLRW generated by city, state and federal governmental entities (including VA hospitals)
- 2 of 15 generators shipped in 2011
- A significant decrease in volume from last year
- A significant decrease in activity from the previous year

Table 7 – 2005 – 2011 Governmental Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	22	18	18	19	18	15	15
# of shippers	5	3	4	4	2	1	2
Volume (ft^3)	561	262	154	191	30	620	27
Volume (m^3)	16	7	4	6	1	18	1
Activity (mCi)	12,244	65	5,498	335	1	644	<1
Activity (MBq)	453,028	2,405	203,426	12,395	39	23,823	8

Table 8 – 2011 Governmental Generators Shipping LLRW for Processing or Disposal

Governmental Generator	Volume (ft^3)	Volume (m^3)	Activity (mCi)	Activity (MBq)
Capt. James A Lovell Federal Health Care Center	10.8	0.3	0.1	3.0
U.S. Department of the Army	16.4	0.5	0.1	5.2
Total	27.2	0.8	0.2	8.1

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
- 13 of 58 generators shipped in 2011
- A significant increase in waste volume and activity from the previous year

Table 9 – 2005 – 2011 Industrial Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	74	81	71	66	66	65	58
# of shippers	19	24	15	17	17	15	13
Volume (ft^3)	19,776	21,940	6,194	10,072	24,865	11,295	67,298
Volume (m^3)	560	621	176	285	704	320	1,906
Activity (Ci)	11	4	138	46	41	20	112
Activity (GBq)	407	148	5,140	1,705	1,515	738	4,153

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

Table 10 – 2011 Industrial Generators Shipping LLRW for Processing or Disposal

Industrial Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
Abbott Laboratories	455.7	12.9	103,780.4	3,839,873.6
Accenture, LLP	1.4	<0.1	<0.1	1.8
APL Engineered Materials, Inc.	15.6	0.4	1.0	37.7
Chicago Magnesium Casting Co.	49,636.0	1,405.7	55.0	2,035.0
Conoco Phillips-WBR Refining LP	1.0	<0.1	400.0	14,800.0
GE Healthcare	396.0	11.2	7,578.3	280,396.2
General Dynamics	6,874.0	194.7	22.1	818.5
PETNET Solutions	22.5	0.6	7.2	267.7
Railway Industrial Specialties	4.0	0.1	<0.1	<0.1
Richardson Electronics, LTD	142.4	4.0	0.4	14.4
Siemens Medical Solutions USA, Inc	103.0	2.9	24.9	921.9
Unitech Services Group, Inc.	5,220.0	147.8	300.2	11,108.6
Water Remediation Technology, LLC	4,426.0	125.3	64.0	2,368.0
Total	67,297.6	1,905.9	112,233.6	4,152,643.2

Note – Totals may not add due to rounding.

Medical Category

- Includes LLRW generated by hospitals, medical centers, clinics, laboratories and private medical offices
- 9 of the 316 medical generators shipped waste during 2011
- The majority of medical generators don't generate waste that requires offsite management
- The waste volume and activity increased significantly from the previous year

Table 11 – 2005 – 2011 Medical Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	311	318	326	327	329	319	316
# of shippers	10	4	4	16	8	7	9
Volume (ft^3)	165	729	405	217	226	155	397
Volume (m^3)	5	21	11	5	6	4	11
Activity (mCi)	1,341	22	894	4,530	62	50	605
Activity (MBq)	49,617	814	33,078	167,610	2,296	1,854	22,377

Table 12 – 2011 Medical Generators Shipping LLRW for Processing or Disposal

Medical Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
Central DuPage Hospital	1.0	<0.1	<0.1	0.1
Loyola University Medical Center	7.5	0.2	5.6	208.4
Northern Illinois Medical Center	36.0	1.0	5.0	185.0
Northwestern Memorial Hospital	83.2	2.4	0.9	34.5
Rush-Presbyterian-St. Luke's Medical Center	0.7	<0.1	1.0	37.0
The Children's Memorial Hospital	135.0	3.8	88.6	3,276.8
St. James Hospital/Olympia Fields	2.0	0.1	500.0	18,500.0
Midwest Radiation Protection Service, LTD.	4.1	0.1	3.2	118.8
STERIS Isomedix Services	127.2	3.6	0.5	16.8
Total	396.7	11.2	604.8	22,377.3

Note – Totals may not add due to rounding.

Reactor Category

- Includes LLRW generated at the nuclear power stations
- All 7 generators shipped waste in 2011
- The waste volume increased and activity decreased in 2011.
- 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

Table 13 – 2005 – 2011 Reactor Generator Shipment Summary

Year	2005	2006	2007	2008	2009	2010	2011
# of generators	7	7	7	7	7	7	7
# of shippers	6	6	7	7	6	6	7
Volume (ft^3)	243,195	394,276	199,043	240,475	226,885	270,393	322,928
Volume (m^3)	6,887	11,166	5,637	6,810	6,425	7,658	9,429
Activity (Ci)	11,072	456,221	15,492	21,846	1,261	1,911	1,363
Activity (TBq)	410	16,880	573	808	47	71	50

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 – 2011 Reactor Generators Shipping LLRW for Processing or Disposal

Reactor Generator	Volume		Activity	
	(ft^3)	(m^3)	(mCi)	(MBq)
Braidwood	13,056.6	369.8	30,993.4	1,146,756.9
Byron	22,824.2	646.4	75,357.5	2,788,228.0
Clinton	23,962.4	678.6	357,800.4	13,238,615.8
Dresden	73,804.4	2,090.1	260,672.6	9,644,887.6
LaSalle	65,572.0	1,857.0	7,546.4	279,215.0
Quad Cities	79,905.3	2,262.9	623,853.1	23,082,564.3
Zion Station	53,803.0	1,523.7	6,526.2	241,468.2
Total	332,927.9	9,428.5	1,362,749.6	50,421,735.8

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 contains lower concentration of both short and long half-life radionuclides. Class B waste contains higher concentrations of short half-life radionuclides while Class C contains higher concentrations of long half-life radionuclides. Both Class B and C wastes must meet

more stringent waste form and packaging requirements while Class C wastes must be disposed with an intruder barrier with an effective 500-year service life. The maximum concentrations of radioactivity are specified for waste so that the amount of radioactivity remaining at the end of 500 years does not pose any significant environmental health or safety hazard, even if someone intrudes into the waste.

Table 15 – Distribution by Class of LLRW Shipped by Generator Category in 2011

Generator	Class A Volume		Class B Volume		Class C Volume		Total Category Volume	
Category	(ft^3)	(m^3)	(ft^3)	(m^3)	(ft^3)	(m^3)	(ft^3)	(m^3)
Academic	2,578.6	73.0					2,578.6	73.0
Fuel-Cycle	122,200.0	3,460.7					122,200.0	3,460.7
Governmental	27.2	0.8					27.2	0.8
Industrial	67,147.7	1,901.6	7.5	0.2	142.4	4.0	67,297.6	1,905.9
Medical	396.6	11.2					396.7	11.2
Reactor	332,927.9	9,428.5					332,927.9	9,428.5
Total	403,078.1	14,875.8	7.5	0.2	142.4	4.0	525,427.9	14,880.0

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 may increase in the future with the opening of a LLRW disposal facility in Texas and the development of 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 2011, eighteen academic facilities, ten industrial facilities and twenty one medical facilities disposed of specific waste into 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 waste for decay up to 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 2011

Radionuclide	Half-Life		Academic	Governmental	Industrial	Medical	Total
Ag-108	2.4	Minutes	1				1
Ar-41	1.83	Hours			1		1
Au-198	64.8	Hours				1	1
Ba-139	83.1	Minutes			1		1
Br-82	35.34	Hours			1		1
Cl-38	37.29	Minutes			1		1
Cr-51	27.7	Days			3	1	4
Cs-131	9.7	Days			1	2	3
F-18	109.7	Minutes			6	33	39
Ga-67	3.3	Days		1	7	94	102
I-123	13.2	Hours		3	6	110	119
I-125	60.1	Days	1			18	19
I-131	8	Days			1	96	97
I-135	6.68	Hours			1		1
In-111	2.8	Days		2	7	94	103
Ir-192	74	Days				1	1
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	1	3
P-32	14.3	Days	3		1	4	8
P-33	25.4	Days				1	1
Pd-103	17	Days				8	8
Rb-32	1.3	Minutes				1	1
S-35	87.4	Days	1			1	2
Sb-122	67	Hours			1		1
Sm-153	47	Hours			3	14	17
Sr-85	64.84	Days				2	2
Sr-89	50.6	Days			4	13	17
Sr-91	9.67	Hours			1		1
Sr-92	2.71	Hours			1		1
Tc-99m	6	Hours	2	4	7	268	281
Tc-101	14.2	Minutes				1	1
Tl-201	73.1	Hours		1	7	162	170
Xe-123	2.14	Hours				1	1
Xe-133	5.2	Days		1	5	70	76
Y-90	64.1	Hours			4	10	14

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 which 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 2011

Waste Type	Volume (ft^3)	Volume (m^3)	Radionuclides
Chromium			
corrosion-inhibiting chromates	945	26.8	U-Nat
Metals			
Mercury	4	0.1	Co-60, Cs-134, Cs-137, Mn—54
Other			U-Nat
Scintillation Fluids			
Toluene	108.4	3.1	C-14, H-3, Cl-36, P-32
Xylene	7.5	0.2	Cs-134, Cs-137, Mn-54, Co-60
Solvents & Other Organic Fluids Other	35	1.0	Co-60, Co-58, C-14, Cs-134, Cs-137, H-3, Mn-54, P-32, U-238
Alkaline Liquids	75.02	2.12	Co-60, Cs-134, Cs-137, Mn-54
Other	57	1.6	Co-57, Co-60, Cs-134, Cs-137, H-3, Mn-54,U-Nat,
Total	1,232	34.9	

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Chapter Three

Waste Projections

The 2011 Annual Survey required the generators to project the amount of LLRW they expect to produce or possess between 2012 and 2018. 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)
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	380	207	209	232	235	237	239
Fuel Cycle	500	650	500	500	500	500	500
Governmental	17	6	6	6	6	6	6
Industrial	6,609	6,600	6,593	6,620	6,897	6,864	6,461
Medical	613	479	386	393	393	393	286
Reactor	351,152	970,692	578,670	410,692	1,210,671	460,692	289,664
Total	358,771	978,634	586,364	418,443	1,218,702	468,692	297,156

Table 19 – LLRW Volume Projections (m^3)
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	11	6	6	7	7	7	7
Fuel Cycle	14	18	14	14	14	14	14
Governmental	<1	<1	<1	<1	<1	<1	<1
Industrial	187	187	187	187	195	194	183
Medical	17	14	11	11	11	11	8
Reactor	9,945	27,490	16,388	11,631	34,286	13,047	8,203
Total	10,174	27,715	16,606	11,850	34,513	13,273	8,415

Note – Totals may not add due to rounding.

Table 20 – LLRW Activity Projections (mCi)
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	176	26	27	28	28	29	29
Fuel Cycle	150	120,150	150	150	150	150	150
Governmental	6,480,101	101	101	101	101	101	101
Industrial	264,619	67,613	7,613	68,113	8,614	67,614	7,612
Medical	62	60	60	60	60	57	55
Reactor	95,922,556	95,640,916	97,678,846	95,633,356	95,524,316	95,814,116	95,511,733
Total	102,667,664	95,828,866	97,686,797	95,701,808	95,533,269	95,882,067	95,519,680

Table 21 – LLRW Activity Projections (GBq)
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	7	1	1	1	1	1	1
Fuel Cycle	6	4,446	6	6	6	6	6
Governmental	239,764	4	4	4	4	4	4
Industrial	9,791	2,502	282	2,520	319	2,502	282
Medical	2	2	2	2	2	2	2
Reactor	3,549,135	3,538,714	3,614,117	3,538,434	3,534,400	3,545,122	3,533,934
Total	3,798,705	3,545,669	3,614,412	3,540.967	3,534,732	3,547,637	3,534,229

Note – Totals may not add due to rounding. The units for activity are GBq. 1 GBq = 1,000 MBq

Mixed Waste Projections

The 2011 Annual Survey asked generators to project the volume and activity of mixed waste they thought they would produce between 2012 and 2018. 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 2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	202.5	82.5	82.5	82.5	82.5	82.5	82.5
Fuel Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	228.4	228.4	278.4	328.3	228.3	278.3	228.3
Medical	0.0	7.5	0.0	7.5	0.0	7.5	0.0
Reactor	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total	438.9	326.4	368.9	426.3	318.8	376.3	318.8

Table 23 – Mixed Waste Volume Projections (m^3) by Generator Category 2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	5.7	2.3	2.3	2.3	2.3	2.3	2.3
Fuel Cycle	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0
Industrial	6.5	6.5	7.9	9.3	6.5	7.9	6.5
Medical	0	0.2	0	0.2	0	0.2	0
Reactor	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total	12.4	9.2	10.4	12.1	9.0	10.7	9.0

Note – Totals may not add due to rounding.

Table 24 – Mixed Waste Activity Projections (mCi) by Generator Category
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	28.3	8.3	8.3	8.3	8.3	8.3	8.3
Fuel Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	507.5	507.5	1,008.5	1,508.5	507.5	807.5	507.5
Medical	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Reactor	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total	539.8	520.8	1,020.8	1,521.8	519.8	820.8	519.8

Note – Totals may not add due to rounding.

Table 25 – Mixed Waste Volume Projections (MBq) by Generator Category
2012 - 2018

Year	2012	2013	2014	2015	2016	2017	2018
Academic	1,045.3	305.3	305.3	305.3	305.3	305.3	305.3
Fuel Cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	18,777.5	18,777.5	37,314.5	55,814.5	18,777.5	29,877.5	18,777.5
Medical	0.0	37.0	0.0	37.0	0.0	37.0	0.0
Reactor	148.0	148.0	148.0	148.0	148.0	148.0	148.0
Total	19,970.8	19,267.8	37,767.8	56,304.8	19,230.8	30,367.8	19,230.8

Note – Totals may not add due to rounding.