



2009 Annual Survey Report



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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 26th report based on the response to those surveys.

Please note that where possible International System of Units (SI) are included in parentheses behind English units. Annual Reports are available for the years 1984 through 2009. Comments on this report and suggestions for preparing future reports are welcome and should be addressed to:

Manager, LLRW and Decommissioning Section
Bureau of Environmental 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 megabecquerel = 1,000,000 becquerels

1 gigabecquerel = 1,000,000,000 becquerels

1 terabecquerel = 1,000,000,000,000 becquerels

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 2009 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. 2014).

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 EnergySolutions' 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 2009 Annual Survey

Illinois LLRW generation in 2009 continued to demonstrate the typical variation in year to year production. The waste volume increased slightly from 2008; however the activity dropped significantly from the previous year. The number of generators held virtually steady from 2008 to 2009 with only a decline of one generator. However, the number of generators who shipped waste continued the steady decline since 2000.

In 2009 the large volume generators were a fuel cycle facility that performed major cleanup activities and the nuclear power stations (reactor generators).

Chapter Two

2009 Annual Survey Results

There were 455 LLRW generators in Illinois during 2009, a decrease of 1 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 329. 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
2003 – 2009**

Generator Category	2003	2004	2005	2006	2007	2008	2009
Academic	40	36	35	32	33	35	33
Fuel Cycle	2	2	2	2	2	2	2
Governmental	21	22	22	18	18	19	18
Industrial	76	80	74	81	71	66	66
Medical	283	295	311	318	326	327	329
Reactor	<u>7</u>						
Total	429	442	451	458	457	456	455

Table 2 – 2009 Volume and Activity by Generator Category

Generator Category	Volume (ft ³)	Volume (m ³)	Activity (Ci)	Activity (GBq)
Academic	911	25.7	2.5	93.5
Fuel-Cycle	225,614	5,174.7	5.2	0.2
Governmental	30	0.8	0.001	0.04
Industrial	24,865	704.2	40.9	1,514.5
Medical	226	6.3	0.1	2.3
Reactor	<u>226,886</u>	<u>6,425.4</u>	<u>1,261.5</u>	<u>46,658.7</u>
Totals	478,532	12,337.1	1,310.2	48,269.2

The following pages detail the responses received to the 2009 Annual Survey. The responses have been consolidated by generator category.

Academic Category –

- Includes LLRW generated at high schools, colleges, universities and associated research facilities.
- 11 of 33 generators shipped in 2009
- A decrease in waste volume from previous year, though still within historical range
- An increase in activity from the previous year

Table 3 – 2003 – 2009 Academic Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	40	36	35	32	33	35	33
# of shippers	18	11	11	9	9	12	11
Volume (ft ³)	1,481	892	1,828	1,096	962	2,380	911
Volume (m ³)	42	25	52	31	28	67	26
Activity (mCi)	1,167	5,085	20,170	2,089	5,096	1,003	2,528
Activity (MBq)	43,179	188,145	746,290	77,293	188,552	37,111	93,526

Table 4 – 2009 Academic Generators Shipping LLRW for Processing or Disposal

Academic Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Astellas Research Institute of America	27.2	0.8	14.4	531.3
Eureka College	0.7	<0.1	1	37.0
Glenbard North High School	1.4	<0.1	<0.01	0
IIT Research Institute	24.0	0.7	6.7	248.3
Loyola University of Chicago	34.4	1.0	5.1	190.5
Naperville Central High School	1.4	0.0	0.0	0.0
Northwestern University	184.0	5.2	66.3	2,453.5
Peoria School District	1.4	<0.1	<0.01	0.1
Rosalind Franklin University School of Medicine and Science	105.0	3.0	2.9	107.2
The University of Chicago	270.0	7.6	114.3	4,228.8
U of I at Urbana-Champaign	<u>262.0</u>	<u>7.4</u>	<u>2,317.0</u>	<u>85,729.0</u>
Total	911.5	25.7	2,527.7	93,525.7

Fuel Cycle Category

- Includes LLRW generators whose operations are part of the nuclear fuel cycle
- Both fuel cycle generators shipped this year
- An increase in waste volume and activity generation from the previous year representing a continuation of a project to clear out large volumes of waste at a generator facility

Table 5 – 2003 – 2009 Fuel Cycle Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	2	2	2	2	2	2	2
# of shippers	2	1	1	2	1	1	2
Volume (ft ³)	9,282	8,997	36,576	468,831	37,391	210,426	225,614
Volume (m ³)	263	255	1,036	13,277	1,059	5,959	6,389
Activity (mCi)	378	3328	273	80,203	400	2,248	5,175
Activity (MBq)	13,986	12,136	10,101	2,967,511	14,800	83,176	191,465

Table 6 – 2009 Fuel Cycle Generators Shipping LLRW for Processing or Disposal

Fuel Cycle Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
GE Hitachi Nuclear Energy	14,114.0	399.7	2,623.8	97,079.9
Honeywell International Inc.	<u>211,500.0</u>	<u>5,989.7</u>	<u>2,550.9</u>	<u>94,384.9</u>
Total	225,614.0	6,389.4	5,174.7	191,464.8

Governmental Category

- Includes LLRW generated by city, state and federal governmental entities (including VA hospitals)
- 2 of 18 generators shipped in 2009
- Dramatic decrease in waste volume and activity from the previous year and was the lowest in 8 years

Table 7 – 2003 – 2009 Governmental Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	21	22	22	18	18	19	18
# of shippers	3	4	5	3	4	4	2
Volume (ft ³)	595	759	561	262	154	191	30
Volume (m ³)	17	21	16	7	4	6	1
Activity (mCi)	9,032	1,534	12,244	65	5,498	335	1.1
Activity (MBq)	334,184	56,758	453,028	2,405	203,426	12,395	38.9

Table 8 – 2009 Governmental Generators Shipping LLRW for Processing or Disposal

Governmental Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Du Page County Sheriff	0.7		0.01	0.4
North Chicago VA Medical Center	<u>29.7</u>	<u>0.8</u>	<u>1.1</u>	<u>38.9</u>
Total	30.4	0.8	1.1	39.3

Industrial Category

- Includes LLRW generated by private entities that provide products or services to the private and public sectors
- 17 of 66 generators shipped in 2009
- A significant increase in waste volume from the previous year
- A decrease in waste activity from the previous year

Table 9 – 2003 – 2009 Industrial Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	76	80	74	81	71	66	66
# of shippers	19	26	19	24	15	17	17
Volume (ft ³)	14,972	10,544	19,776	21,940	6,194	10,072	24,865
Volume (m ³)	424	299	560	621	176	285	704
Activity (Ci)	55	102	11	4	138	46	41
Activity (GBq)	2,035	3,774	407	148	5,140	1,705	1,515

Table 10 – 2009 Industrial Generators Shipping LLRW for Processing or Disposal

Industrial Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Aqua America	15	0.4	0.02	0.7
Abbott Laboratories	761.6	21.6	40,352.2	1,493,033.1
Baxter Healthcare Corporation	21.8	0.6	0.0	0.0
Caterpillar	0.7	<0.1	0.1	3.1
ConocoPhillips - WRB Refining LLC	4.0	0.1	79.0	2923.0
Designed Alloys	1.4	<0.1	<0.1	0.1
EPL Bio-Analytical Services, Inc.	0.0	0.0	45.0	1666.1
EXPERIMUR	2.8	0.1	0.0	0.1
G E Healthcare	5,876.9	166.4	108.4	4012.2
General Dynamics - OTS	3,467.0	98.2	5.5	204.8
Lexington of Lake Zurich	5.4	0.2	5.0	185.0
Olin Corporation	1.3	0.0	0.0	1.1
Pactive Corp.	1.4	<0.1	<0.1	0.0
Thompson Steel	6.0	0.2	2,000.0	74,000.0
Unitech Services Group, Inc.	6,990.0	198.0	247.2	9145.3
Water Remediation Technology, LLC.	<u>7,740.0</u>	<u>219.2</u>	<u>96.0</u>	<u>3552.0</u>
Total	24,865.3	704.2	40,933.5	1,514,537.7

Medical Category

- Includes LLRW generated by hospitals, medical centers, clinics, laboratories and private medical offices
- 8 of the 329 medical generators shipped waste during 2009
- The majority of medical generators don't generate waste that requires offsite management
- The waste volume increased slightly from the previous year
- The waste activity decreased significantly from the previous year

Table 11 – 2003 – 2009 Medical Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	283	295	311	318	326	327	329
# of shippers	7	4	10	4	4	16	8
Volume (ft ³)	101	89	165	729	405	217	226
Volume (m ³)	3	3	5	21	11	5	6
Activity (mCi)	2,466	14	1,341	22	894	4,530	62
Activity (MBq)	91,242	518	49,617	814	33,078	167,610	2,296

Table 12 – 2009 Medical Generators Shipping LLRW for Processing or Disposal

Medical Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Anil K. Khemani, M.D.	1.0	0.0	1.0	37.0
Astellas Research	34.9	1.0	13.5	499.5
Bowman Research	13.2	0.4	1.1	40.7
Loyola University Medical Center	19.1	0.5	44.3	1,639.8
Northwestern Memorial Hospital	92.1	2.6	0.0	0.0
OSF Center for Health	60.0	1.7	2.0	75.5
Vista Health System	4.0	0.1	0.1	3.7
Vista Medical Center	1.4	<0.1	<0.1	<0.1
Total	225.7	6.3	62.0	2,296.2

Reactor Category

- Includes LLRW generated at the nuclear power stations
- 6 of the 7 generators shipped waste in 2009
- The waste volume and activity increased in 2009 which will vary substantially depending on the number of stations conducting refueling outages or other maintenance activities

Table 13 – 2003 – 2009 Reactor Generator Shipment Summary

Year	2003	2004	2005	2006	2007	2008	2009
# of generators	7	7	7	7	7	7	7
# of shippers	6	6	6	6	7	7	6
Volume (ft ³)	137,249	194,216	243,195	394,276	199,043	240,475	226,885
Volume (m ³)	3,887	5,500	6,887	11,166	5,637	6,810	6,425
Activity (Ci)	8	11,415	11,072	456,221	15,492	21,846	1,261
Activity (TBq)	<1	422	410	16,880	573	808	46.7

Please note the SI units for activity are in TBq. 1 TBq = 1,000 GBq

Table 14 – 2009 Reactor Generators Shipping LLRW for Processing or Disposal

Reactor Generator	Volume		Activity	
	(ft ³)	(m ³)	(Ci)	(GBq)
Braidwood	24,450.1	692.4	48.9	1,810.6
Byron	20,434.9	578.7	42.9	1,588.7
Clinton	12,813.0	362.9	504.9	18,679.9
Dresden	66,056.6	1,870.7	469.8	17,382.7
LaSalle	55,065.1	1,559.4	31.0	1,147.0
Quad Cities	<u>48,066.0</u>	<u>1,361.2</u>	<u>163.5</u>	<u>6,049.9</u>
Total	226,885.7	6,425.4	1,261.0	46,658.7

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 2009

Generator Category	Class A Volume		Class B Volume		Class C Volume		Total Category Volume	
	(ft ³)	(m ³)	(ft ³)	(m ³)	(ft ³)	(m ³)	(ft ³)	(m ³)
Academic	911	25.7					908	25.7
Fuel-Cycle	225,614	5,174.7					225,614	5,174.7
Governmental	30	0.8					30	0.8
Industrial	24,861	704.2			4	<1	24,865	704.2
Medical	226	4.9					172	4.9
Reactor	<u>226,886</u>	<u>6,425.4</u>					<u>226,886</u>	<u>6,425.4</u>
Total	478,528	12,337.1			4	<1	478,532	12,337.1

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 2009, fifteen academic facilities, six governmental facilities, six industrial facilities and twelve medical facilities disposed of specific waste into sanitary sewerage.

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 2009

Radionuclide	Half-Life	Academic	Governmental	Industrial	Medical	Total
Ar-41	1.83 Hours			1		1
Au-198	64.8 Hours				1	1
Ba-139	83.1 Minutes			1		1
Bi-206	6.24 Days	1				1
Br-82	35.34 Hours			1		1
Cl-38	37.29 Minutes			1		1
Cr-51	27.7 Days			3	6	9
Cs-131	9.7 Days				1	1
Cs-138	32.2 Minutes			1		1
F-18	109.7 Minutes			5	32	37
Ga-67	3.3 Days		1	7	111	119
Ga-68	68.3 Minutes				1	1
I-123	13.2 Hours		3	7	110	120
I-125	60.1 Days	3		44		47
I-130	12.4 Hours				1	1
I-131	8 Days		1	9	81	91
I-135	6.68 Hours			1		1
In-111	2.8 Days		1	9	52	62
Ir-192	74 Days				3	3
K-42	12.4 Hours			1		1
Lu-177	6.7 Days	1				1
Mn-56	2.58 Hours			1		1
Mo-99	66 Hours			3	1	4
P-32	14.3 Days	2		2	4	8
P-33	25.4 Days				2	2
Pd-103	17 Days				11	11
S-35	87.4 Days	2			2	4
Sb-122	67 Hours			1		1
Sm-153	47 Hours			2	17	19
Sr-89	50.6 Days			4	16	20
Sr-91	9.67 Hours			1		1
Sr-92	2.71 Hours			1		1
Tc-95m	61 Days				1	1
Tc-96m	52 Minutes				2	2
Tc-99m	6 Hours	3	4	10	301	318
Tl-200	26.1 Hours				3	3
Tl-201	73.1 Hours		2	7	192	201
Tl-210	1.3 Minutes				1	1
Xe-123	2.14 Hours				1	1
Xe-133	5.2 Days		2	5	72	79
Y-90	64.1 Hours	1		4	4	9

Mixed Waste

LLRW that also meets the U.S. Environmental Protection Agency’s criteria as hazardous waste is called “mixed waste.” 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 2009

Waste Type	Volume		Radionuclides
	(ft ³)	(m ³)	
Chromium			
corrosion-inhibiting chromates	5	<1	Co-60, Zn-69m
Metals			
Mercury	56	1.6	Co-60, Cs-134, Mn-54
Scintillation Fluids			
Benzene	1	<1	C-14, Fe-59, H-3
Toluene	100	2.8	C-14, Fe-59, H-3
Xylene	119	3.4	C-14, Co-60, Cs-134, Cs-137, H-3, Mn-54, S-35
Solvents & Other Organic Fluids	345	9.8	C-14, Co-57, Cs-134, Cs-137, Fe-59, H-3, Mn-54, U-Nat.
Alkaline Liquids	525	14.9	Co-60, Cs-134, Cs-137, Mn-54
Other	<u>660</u>	<u>18.7</u>	C-14, Cl-36, Co-60, Cs-134, Cs-137, H-3, Mn-54, Th-232, U
Total	1811	51.2	

Chapter Three

Waste Projections

The 2009 Annual Survey required the generators to project the amount of LLRW they expect to produce or possess between 2010 and 2016. 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 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 (ft³)
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	270	130	130	140	140	150	150
Fuel Cycle	10,000	1,430	1,280	1,280	1,280	1,280	1,430
Governmental	42	42	42	42	42	42	42
Industrial	5,093	5,445	8,085	5,446	5,093	5,093	5,093
Medical	754	374	284	284	284	284	284
Reactor	<u>196,438</u>	<u>195,934</u>	<u>196,559</u>	<u>196,175</u>	<u>196,077</u>	<u>196,175</u>	<u>196,198</u>
Total	212,597	203,354	206,379	203,366	202,915	203,023	203,196

**Table 19 – LLRW Volume Projections (m³)
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	8	4	4	4	4	4	4
Fuel Cycle	283	40	36	36	36	36	40
Governmental	1	1	1	1	1	1	1
Industrial	144	154	229	154	144	144	144
Medical	21	11	8	8	8	8	8
Reactor	<u>5,563</u>	<u>5,549</u>	<u>5,567</u>	<u>5,556</u>	<u>5,553</u>	<u>5,556</u>	<u>5,556</u>
Total	6,021	5,759	5,845	5,759	5,747	5,750	5,754

**Table 20 – LLRW Activity Projections (Ci)
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	0	0	0	0	0	0	0
Fuel Cycle	1	120	0	0	0	0	120
Governmental	0	4	0	0	0	0	0
Industrial	4	0	129	112	28	4	4
Medical	0	0	0	0	0	0	0
Reactor	95,623	95,318	95,813	95,558	95,333	95,558	95,453
Total	95,627	95,442	95,942	95,669	95,360	95,561	95,576

**Table 21 – LLRW Activity Projections (GBq)
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	7	1	1	1	1	1	1
Fuel Cycle	19	4,451	11	11	11	11	4,451
Governmental	6	130	1	1	1	1	1
Industrial	130	4	4,757	4,126	1,018	130	130
Medical	6	4	4	4	4	4	4
Reactor	3,538,033	3,526,748	3,545,063	3,535,628	3,527,303	3,535,628	3,531,743
Total	3,538,200	3,531,337	3,549,836	3,539,770	3,528,337	3,535,774	3,536,329

Mixed Waste Projections

The 2009 Annual Survey asked generators to project the volume and activity of mixed waste they thought they would produce between 2010 and 2016. 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 (ft³) by Generator Category
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	221	101	102	102	102	103	103
Fuel Cycle	125	0	0	0	0	0	0
Government	0	0	0	0	0	0	0
Industrial	11	11	11	11	11	11	11
Medical	8	0	0	0	0	0	0
Reactor	<u>8</u>						
Total	373	120	121	121	121	122	122

**Table 23 – Mixed Waste Volume Projections (m³) by Generator Category
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	6	3	3	3	3	3	3
Fuel Cycle	4	0	0	0	0	0	0
Government	0	0	0	0	0	0	0
Industrial	<1	<1	<1	<1	<1	<1	<1
Medical	<1	0	0	0	0	0	0
Reactor	<u><1</u>						
Total	11	3	3	3	3	3	3

**Table 24 – Mixed Waste Activity Projections (mCi) by Generator Category
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	31	11	11	11	11	12	12
Fuel Cycle	350	0	0	0	0	0	0
Government	1	1	1	1	1	1	1
Industrial	312	312	312	312	312	312	312
Medical	2	0	0	0	0	0	0
Reactor	<u>4</u>						
Total	700	328	328	328	328	329	329

**Table 25 – Mixed Waste Volume Projections (GBq) by Generator Category
2010 - 2016**

Year	2010	2011	2012	2013	2014	2015	2016
Academic	1,147	407	407	407	407	426	426
Fuel Cycle	12,950	0	0	0	0	0	0
Government	37	37	37	37	37	37	37
Industrial	11,545	11,545	11,545	11,544	11,544	11,544	11,544
Medical	56	0	0	0	0	0	0
Reactor	<u>148</u>						
Total	25,883	12,137	12,137	12,136	12,136	12,155	12,155