



2008 Annual Survey Report



TABLE OF CONTENTS

	Page
TABLE OF CONTENTS.....	i
LIST OF TABLES.....	ii
PREFACE.....	iv
CONVERSION FACTORS.....	iv

CHAPTER 1

Introduction.....	1
Onsite Waste Management.....	1
Offsite Waste Management.....	1
Available Disposal Capacity.....	2
Annual Surveys.....	2
LLRW Tracking System.....	2
Conclusion and Observations from the 2008 Annual Survey.....	2

CHAPTER 2 - 2008 SURVEY RESULTS

2008 Annual Survey Results.....	5
Academic Category.....	6
Fuel Cycle Category.....	7
Governmental Category.....	7
Industrial Category.....	8
Medical Category.....	9
Reactor Category.....	10
Volume and Classes of LLRW Shipped Directly to Disposal Facilities, BrokersAnd Processors.....	11
Specific Waste.....	12
LLRW Stored On-Site for Decay to Background Levels.....	12
Mixed Waste.....	14

CHAPER 3 –WASTE PROJECTIONS

Waste Projections.....	15
Mixed Waste Projections.....	17

LIST OF TABLES

	Page
TABLE 1	Illinois LLRW Generator Survey Response by Generator Category 2002-2008 5
TABLE 2	2008 Volume and Activity by Generator Category 5
TABLE 3	2002-2008 Academic Generator Shipment Summary 6
TABLE 4	2008 Academic Generators Shipping LLRW for Processing or Disposal 6
TABLE 5	2002-2008 Fuel Cycle Generator Shipment Summary 7
TABLE 6	2008 Fuel Cycle Generators Shipping LLRW for Processing or Disposal 7
TABLE 7	2002-2008 Governmental Generator Shipment Summary 8
TABLE 8	2008 Governmental Generators Shipping LLRW for Processing or Disposal 8
TABLE 9	2002-2008 Industrial Generator Shipment Summary 8
TABLE 10	2008 Industrial Generators Shipping LLRW for Processing or Disposal 9
TABLE 11	2002-2008 Medical Generator Shipment Summary 10
TABLE 12	2008 Medical Generators Shipping LLRW for Processing or Disposal 10
TABLE 13	2002-2008 Reactor Generator Shipment Summary 11
TABLE 14	2008 Reactor Generators Shipping LLRW for Processing or Disposal 11
TABLE 15	Distribution by Class of LLRW Shipped by Generator Category in 2008 12

LIST OF TABLES

(cont.)

TABLE 16	Radionuclides Held for Decay in 2008.....	13
TABLE 17	Types of Mixed Waste Stored On-Site at the end of 2008	14
TABLE 18	LLRW Volume Projections (ft ³) 2009-2015.....	15
TABLE 19	LLRW Volume Projections (m ³) 2009-2015	15
TABLE 20	LLRW Activity Projections (Ci) 2009-2015	16
TABLE 21	LLRW Activity Projections (GBq) 2009-2015	16
TABLE 22	Mixed Waste Volume Projections (ft ³) by Generator Category 2009-2015	17
TABLE 23	Mixed Waste Volume Projections (m ³) by Generator Category 2009-2015	17
TABLE 24	Mixed Waste Activity Projections (mCi) by Generator Category 2009-2015	18
TABLE 25	Mixed Waste Activity Projections (GBq) by Generator Category 2009-2015	18

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 25th 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 2007. 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 2008 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

LLRW generators perform some 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, 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 2008 Annual Survey

Illinois LLRW generation in 2008 continued to demonstrate the typical variation in year to year production. The waste volume and activity increased significantly from 2007, with the closing of the Barnwell, South Carolina disposal facility, waste generators shipped all unwanted Class B and C waste for disposal during the first half of 2008. The number of generators held virtually steady from 2007 to 2008 with only a decline of one generator. However, the number of generators who shipped waste continued the steady decline since 2000.

In 2008 the large volume generators were a fuel cycle facility that performed major cleanup activities and the nuclear power stations (reactor generators) due to fluctuations from year to year caused by the number of planned and unplanned refueling outages or other maintenance activities. This year was the last opportunity for Illinois generators to dispose of Class B and C wastes until the State of Illinois develops a regional disposal facility (currently planned to coincide with the decommissioning of the nuclear power stations).

Chapter Two

2008 Annual Survey Results

There were 456 LLRW generators in Illinois during 2008, 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 327. 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
2002 – 2008**

Generator Category	2002	2003	2004	2005	2006	2007	2008
Academic	42	40	36	35	32	33	35
Fuel Cycle	2	2	2	2	2	2	2
Governmental	22	21	22	22	18	18	19
Industrial	75	76	80	74	81	71	66
Medical	254	283	295	311	318	326	327
Reactor	<u>7</u>						
Total	402	429	442	451	458	457	456

Table 2 – 2008 Volume and Activity by Generator Category

Generator Category	Volume (ft ³)	Volume (m ³)	Activity (Ci)	Activity (GBq)
Academic	2,380	67	1.00	37
Fuel-Cycle	210,426	5,959	2.24	83
Governmental	191	6	0.33	12
Industrial	10,072	285	46.07	1,705
Medical	217	5	4.53	168
Reactor	<u>240,475</u>	<u>6,810</u>	<u>21,846</u>	<u>808,302</u>
Totals	463,761	13,132	21,905	810,474

The following pages detail the responses received to the 2008 Annual Survey. The responses have been consolidated by generator category.

Academic Category –

- Includes LLRW generated at high schools, colleges, universities and associated research facilities.
- 12 of 35 generators shipped in 2008
- A increase in waste volume from previous year, though still within historical range
- A decrease in activity from the previous year, though still within historical range

Table 3 – 2002 – 2008 Academic Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	42	40	36	35	32	33	35
# of shippers	16	18	11	11	9	9	12
Volume (ft ³)	1,684	1,481	892	1,828	1,096	962	2,380
Volume (m ³)	48	42	25	52	31	28	67
Activity (mCi)	5,078	1,167	5,085	20,170	2,089	5,096	1,003
Activity (MBq)	187,886	43,179	188,145	746,290	77,293	188,552	37,111

Table 4 – 2008 Academic Generators Shipping LLRW for Processing or Disposal

Academic Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Astellas Research Inst. of America	20	1	25	925
DePaul University	1	<1	<1	<1
Knox College	49	<1	<1	<1
IIT Research	52	2	18	666
Illinois Institute of Technology	237	7	553	20,461
Memorial Junior H.S.	1	<1	<1	<1
Naperville Central H.S.	1	<1	<1	<1
Northeastern Illinois University	9	<1	<1	<1
Northwestern University	317	9	205	7,585
SIU at Carbondale	395	11	27	999
The University of Chicago	338	10	175	6,475
Louise White School	<u>960</u>	<u>27</u>	<u><1</u>	<u><1</u>
Total	2380	67	1,003	37,111

Fuel Cycle Category

- Includes LLRW generators whose operations are part of the nuclear fuel cycle
- Only 1 of the 2 fuel cycle generators shipped this year
- Significant increase in waste volume and activity generation from the previous year representing a culmination of a project to clear out large volumes of waste at a generator facility

Table 5 – 2002 – 2008 Fuel Cycle Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	2	2	2	2	2	2	2
# of shippers	2	2	1	1	2	1	1
Volume (ft ³)	3,964	9,282	8,997	36,576	468,831	37,391	210,426
Volume (m ³)	112	263	255	1,036	13,277	1,059	5,959
Activity (mCi)	608	378	3328	273	80,203	400	2,248
Activity (MBq)	22,496	13,986	12,136	10,101	2,967,511	14,800	83,176

Table 6 – 2008 Fuel Cycle Generators Shipping LLRW for Processing or Disposal

Fuel Cycle Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Honeywell International	<u>210,426</u>	<u>5,959</u>	<u>2,248</u>	<u>83,176</u>
Total	210,426	5,959	2,248	83,176

Governmental Category

- Includes LLRW generated by city, state and federal governmental entities (including VA hospitals)
- 4 of 19 generators shipped in 2008
- Slight increase in waste volume from the previous year which was the lowest in 8 years
- Slight decrease in waste activity from the previous year

Table 7 – 2002 – 2008 Governmental Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	22	21	22	22	18	18	19
# of shippers	5	3	4	5	3	4	4
Volume (ft ³)	331	595	759	561	262	154	191
Volume (m ³)	9	17	21	16	7	4	6
Activity (mCi)	89	9,032	1,534	12,244	65	5,498	335
Activity (MBq)	3,293	334,184	56,758	453,028	2,405	203,426	12,395

Table 8 – 2008 Governmental Generators Shipping LLRW for Processing or Disposal

Governmental Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Department of Veterans Affairs	90	3	32	1,184
Jesse Brown V.A. Medical Center	73	2	33	1,221
Metro Wtr Recl Dist of Greater Chicago	1	<1	270	9,990
U.S.E.P.A., Region V-St. Clair Site	<u>27</u>	<u>1</u>	<u><1</u>	<u><1</u>
Total	191	6	335	12,395

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 2008
- A significant increase in waste volume from the previous year
- A significant decrease in waste activity from the previous year

Table 9 – 2002 – 2008 Industrial Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	75	76	80	74	81	71	66
# of shippers	26	19	26	19	24	15	17
Volume (ft ³)	6,400	14,972	10,544	19,776	21,940	6,194	10,072
Volume (m ³)	181	424	299	560	621	176	285
Activity (Ci)	103	55	102	11	4	138	46
Activity (GBq)	3,811	2,035	3,774	407	148	5,140	1,705

Table 10 – 2008 Industrial Generators Shipping LLRW for Processing or Disposal

Industrial Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Abbott Laboratories	893	25	36,906	1,365,522
APL Engineered Materials, Inc.	16	1	1	37
Baxter Healthcare Corporation	63	2	108	3,996
Chicago Magnesium Casting Company	2,160	61	557	20,609
Claire Manufacturing Company	1	<1	<1	<1
Continental Tire North America, Inc.	4	<1	<1	<1
DICKEY-john Corporation	1	<1	3	111
E. C. Technologies, Inc.	8	<1	7	259
G.E. Healthcare Medi-Physics	3,103	88	6	222
General Dynamics- OTS	396	11	<1	<1
Kraft Foods, Inc.	1	<1	<1	<1
Oxford Instruments Measurement Systems	<1	<1	8,058	298,146
SBC Ameritech	15	1	<1	<1
UOP/Honeywell	<1	<1	<1	<1
URS Corporation	1	<1	60	2,220
Unitech Services Group, Inc.	3,403	96	372	13,764
Walmart Stores, Inc.	7	<1	<1	<1
Total	10,072	285	46,078	1,704,886

Medical Category

- Includes LLRW generated by hospitals, medical centers, clinics, laboratories and private medical offices
- 16 of the 327 medical generators shipped waste during 2008
- The majority of medical generators don't generate waste that requires offsite management
- The waste volume dropped from the previous year
- The waste activity increased from the previous year but is still within the expected range

Table 11 – 2002 – 2008 Medical Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	254	283	295	311	318	326	327
# of shippers	6	7	4	10	4	4	16
Volume (ft ³)	267	101	89	165	729	405	217
Volume (m ³)	8	3	3	5	21	11	5
Activity (mCi)	326	2,466	14	1,341	22	894	4,530
Activity (MBq)	12,062	91,242	518	49,617	814	33,078	167,610

Table 12 – 2008 Medical Generators Shipping LLRW for Processing or Disposal

Medical Generator	Volume		Activity	
	(ft ³)	(m ³)	(mCi)	(MBq)
Advocate Illinois Masonic Medical Center	10	<1	923	34,151
Clinical Radiologists, S.C.	4	<1	728	26,936
Elgin Eye Clinic	1	<1	33	1,221
Hear Care Centers of IL-Blue Island	1	<1	<1	<1
Louis A. Weiss Memorial Hospital	1	<1	1,087	40,219
Morton Grove Pharmaceuticals	1	<1	<1	<1
Northern Illinois Medical Center	36	1	3	111
Northshore University Healthsystem	4	<1	47	1,739
Northwest Community Hospital	29	1	222	8,214
Northwestern Memorial Hospital	107	3	8	296
Nuclear Oncology, S.C.	1	<1	<1	<1
Rush-Presbyterian-St. Lukes Med. Center	9	<1	7	259
South Suburban Hospital	1	<1	576	21,312
St. Francis Hospital	1	<1	315	11,655
West Suburban Hospital Medical Center	2	<1	478	17,686
Valent Biosciences Corporation	<u>9</u>	<u><1</u>	<u>103</u>	<u>3,811</u>
Total	217	5	4,530	167,610

Reactor Category

- Includes LLRW generated at the nuclear power stations
- All 7 generators shipped waste in 2008
- The waste volume and activity increased in 2008 which will vary substantially depending on the number of stations conducting refueling outages or other maintenance activities

Table 13 – 2002 – 2008 Reactor Generator Shipment Summary

Year	2002	2003	2004	2005	2006	2007	2008
# of generators	7	7	7	7	7	7	7
# of shippers	7	6	6	6	6	7	7
Volume (ft ³)	224,469	137,249	194,216	243,195	394,276	199,043	240,475
Volume (m ³)	6,357	3,887	5,500	6,887	11,166	5,637	6,810
Activity (Ci)	6	8	11,415	11,072	456,221	15,492	21,846
Activity (TBq)	<1	<1	422	410	16,880	573	808

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

Table 14 – 2008 Reactor Generators Shipping LLRW for Processing or Disposal

Reactor Generator	Volume		Activity	
	(ft ³)	(m ³)	(Ci)	(GBq)
Braidwood	20,335	576	8	296
Byron	12,225	346	655	24,235
Clinton	35,334	1,001	6,219	230,103
Dresden	58,151	1,647	2,385	88,245
LaSalle	60,080	1,701	1,288	47,656
Quad Cities	51,790	1,467	11,291	417,767
Zion	2,560	72	<1	<1
Total	240,475	6,810	21,846	808,302

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 2008

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	2,379	67	0	0	1	<1	2,380	67
Fuel-Cycle	210,426	5,959	0	0	0	0	210,426	5,959
Governmental	191	6	0	0	0	0	191	6
Industrial	10,064	285	8	<1	0	0	10,072	285
Medical	217	5	0	0	0	0	217	5
Reactor	<u>238,585</u>	<u>6,757</u>	<u>694</u>	<u>20</u>	<u>1,196</u>	<u>34</u>	<u>240,475</u>	<u>6,810</u>
Total	461,862	13,079	702	20	1,197	34	463,761	13,132

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 2008, 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 2008

Radionuclide	Half-Life	Academic	Governmental	Industrial	Medical	Total
Ar-41	1.83 Hours	0	0	1	0	1
Au-198	64.8 Hours	0	0	0	1	1
Ba-139	83.1 Minutes	0	0	1	0	1
Br-82	35.34 Hours	0	0	1	0	1
Cl-38	37.29 Minutes	0	0	1	0	1
Cr-51	27.7 Days	6	2	3	8	19
Cs-131	9.7 Days	0	0	0	1	1
Cs-138	32.2 Minutes	0	0	1	0	1
F-18	109.7 Minutes	0	0	12	31	43
Ga-67	3.3 Days	2	5	7	129	143
I-123	13.2 Hours	0	4	16	121	141
I-125	60.1 Days	15	1	11	42	69
I-131	8 Days	3	2	10	104	119
I-135	6.68 Hours	0	0	1	0	1
In-111	2.8 Days	4	5	17	108	134
Ir-192	74 Days	0	0	0	1	1
K-42	12.4 Hours	0	0	1	0	1
Lu-177	6.7 Days	1	0	0	0	1
Mn-56	2.58 Hours	0	0	1	0	1
Mo-99	66 Hours	0	0	0	10	10
P-32	14.3 Days	15	1	3	16	35
P-33	25.4 Days	3	1	1	2	7
Pd-103	17 Days	0	0	0	11	11
S-35	87.4 Days	15	1	3	9	28
Sb-122	67 Hours	0	0	1	0	1
Sm-153	47 Hours	0	0	2	16	18
Sr-89	50.6 Days	1	1	4	17	23
Sr-91	9.67 Hours	0	0	1	0	1
Sr-92	2.71 Hours	0	0	1	0	1
Tc-99m	6 Hours	7	7	14	338	366
Tl-200	26.1 Hours	0	0	7	0	7
Tl-201	73.1 Hours	1	2	14	215	232
Tl-202	12 Days	0	0	7	0	7
Xe-133	5.2 Days	1	1	5	76	83
Y-90	64.1 Hours	3	0	5	9	17

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 2008

Waste Type	Volume		Radionuclides
	(ft ³)	(m ³)	
Chromium			
corrosion-inhibiting chromates	44.0	1.0	Co-60, Cs-137, Fe-55, H-3, Ni-63, P-239
Metals			
Mercury	4.0	<1.0	Co-60
Scintillation Fluids			
Benzene	7.5	<1.0	C-14, Ca-45, H-3
Toluene	52.5	1.5	C-14, H-3, P-32
Xylene	52.5	1.5	C-14, H-3, P-32
Other	45.0	1.0	C-14, Co-60, Cs-134, Cs-137, Mn-54
Solvents & Other Organic Fluids	22.5	1.0	Co-60, H-3, Mn-54
Alkaline Liquids	22.5	1.0	Co-58, Co-60, Cs-137
Acidic Liquids	22.5	1.0	Co-58, Co-60, Cs-137
Other	<u>31.0</u>	<u>1.0</u>	C-14, Cl-36, Co-60, Cs-137, H-3, Mn-54, U-238
Total	304.0	9.0	

Chapter Three

Waste Projections

The 2008 Annual Survey required the generators to project the amount of LLRW they expect to produce or possess between 2009 and 2015. 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)
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	565	575	587	590	605	605	605
Fuel Cycle	1,280	1,280	1,380	1,280	1,280	1,280	1,280
Governmental	124	121	121	121	121	121	121
Industrial	10,539	12,858	14,553	14,615	16,610	16,609	16,609
Medical	944	805	655	566	516	516	517
Reactor	<u>68,957</u>	<u>69,037</u>	<u>68,957</u>	<u>209,037</u>	<u>69,103</u>	<u>68,916</u>	<u>69,078</u>
Total	82,409	84,676	86,253	226,209	88,235	88,047	88,210

**Table 19 – LLRW Volume Projections (m³)
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	16	16	17	17	17	17	17
Fuel Cycle	36	36	39	36	36	36	36
Governmental	4	3	3	3	3	3	3
Industrial	298	364	412	414	470	470	470
Medical	27	23	19	16	15	15	15
Reactor	<u>1,953</u>	<u>1,955</u>	<u>1,953</u>	<u>5,920</u>	<u>1,957</u>	<u>1,952</u>	<u>1,956</u>
Total	2,334	2,397	2,443	6,406	2,498	2,493	2,497

**Table 20 – LLRW Activity Projections (Ci)
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	<1	<1	<1	<1	<1	<1	<1
Fuel Cycle	<1	<1	120	<1	<1	<1	<1
Governmental	<1	1	1	1	1	1	1
Industrial	47	172	47	155	47	71	47
Medical	1	1	1	1	1	1	1
Reactor	<u>96</u>						
Total	144	270	265	253	145	163	145

**Table 21 – LLRW Activity Projections (GBq)
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	<1	<1	<1	<1	<1	<1	<1
Fuel Cycle	<1	<1	4,440	<1	<1	<1	<1
Governmental	<1	37	37	37	37	37	37
Industrial	1,739	6,364	1,739	5,735	1,739	2,627	1,739
Medical	37	37	37	37	37	37	37
Reactor	<u>3,552</u>						
Total	5,328	9,990	9,805	9,361	5,365	6,253	5,365

Mixed Waste Projections

The 2008 Annual Survey asked generators to project the volume and activity of mixed waste they thought they would produce between 2009 and 2015. 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
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	100	100	105	105	110	110	110
Fuel Cycle	1,117	1,117	1,117	1,117	1,117	1,117	1,117
Government	<1	<1	<1	<1	<1	<1	<1
Industrial	398	398	398	398	398	398	398
Medical	42	42	42	42	42	42	42
Reactor	<u>47</u>	<u>47</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>8</u>
Total	1,704	1,704	1,671	1,671	1,676	1,676	1,675

**Table 23 – Mixed Waste Volume Projections (m³) by Generator Category
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	3	3	3	3	3	3	3
Fuel Cycle	32	32	32	32	32	32	32
Government	<1	<1	<1	<1	<1	<1	<1
Industrial	11	11	11	11	11	11	11
Medical	1	1	1	1	1	1	1
Reactor	<u>1</u>	<u>1</u>	<u><1</u>	<u><1</u>	<u><1</u>	<u><1</u>	<u><1</u>
Total	48	48	47	47	47	47	47

**Table 24 – Mixed Waste Activity Projections (mCi) by Generator Category
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	<1	<1	<1	<1	<1	<1	<1
Fuel Cycle	<1	<1	<1	<1	<1	<1	<1
Government	<1	<1	<1	<1	<1	<1	<1
Industrial	40	40	40	40	40	40	40
Medical	<1	<1	<1	<1	<1	<1	<1
Reactor	<u><1</u>						
Total	40	40	40	40	40	40	40

**Table 25 – Mixed Waste Volume Projections (GBq) by Generator Category
2009 - 2015**

Year	2009	2010	2011	2012	2013	2014	2015
Academic	<1	<1	<1	<1	<1	<1	<1
Fuel Cycle	<1	<1	<1	<1	<1	<1	<1
Government	<1	<1	<1	<1	<1	<1	<1
Industrial	1,480	1,480	1,480	1,480	1,480	1,480	1,480
Medical	<1	<1	<1	<1	<1	<1	<1
Reactor	<u><1</u>						
Total	1,480	1,480	1,480	1,480	1,480	1,480	1,480