



# 2013 Annual Survey Report



## TABLE OF CONTENTS

|                          | Page |
|--------------------------|------|
| TABLE OF CONTENTS .....  | i    |
| LIST OF TABLES .....     | ii   |
| LIST OF FIGURES .....    | iv   |
| PREFACE .....            | v    |
| CONVERSION FACTORS ..... | v    |
| DATA REPORTING .....     | vi   |

### 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 2013 Annual Survey..... | 2 |

### CHAPTER 2 - 2013 SURVEY RESULTS

|   |    |
|---|----|
| 2013 Annual Survey Results.....   | 4  |
| Academic Category.....  | 6  |
| Fuel Cycle Category.....  | 7  |
| Governmental Category.....  | 8  |
| Industrial Category.....  | 10 |
| Medical Category.....   | 11 |
| Reactor Category.....   | 13 |
| Volume and Classes of LLRW Shipped Directly to Disposal Facilities,<br>Brokers and Processors ..... | 14 |
| Specific Waste.....   | 15 |
| LLRW Stored On-Site for Decay to Background Levels .....  | 16 |
| Mixed Waste .....   | 18 |

### CHAPTER 3 - WASTE PROJECTIONS

|                               |    |
|-------------------------------|----|
| Waste Projections.....        | 20 |
| Mixed Waste Projections ..... | 22 |

### LIST OF TABLES

|          | Page   |
|----------|--|
| TABLE 1  | Illinois LLRW Generator Survey<br>Response by Generator Category 2007-2013 ..... 4 |
| TABLE 2  | 2013 Volume and Activity by Generator Category ..... 5                             |
| TABLE 3  | 2007-2013 Academic Generator Shipment Summary ..... 6                              |
| TABLE 4  | 2013 Academic Generators Shipping LLRW for<br>Processing or Disposal..... 7        |
| TABLE 5  | 2007-2013 Fuel Cycle Generator Shipment Summary..... 7                             |
| TABLE 6  | 2013 Fuel Cycle Generators Shipping LLRW for Processing<br>or Disposal ..... 8     |
| TABLE 7  | 2007-2013 Governmental Generator Shipment Summary..... 9                           |
| TABLE 8  | 2013 Governmental Generators Shipping LLRW for<br>Processing or Disposal..... 9    |
| TABLE 9  | 2007-2013 Industrial Generator Shipment Summary..... 10                            |
| TABLE 10 | 2013 Industrial Generators Shipping LLRW for<br>Processing or Disposal..... 11     |
| TABLE 11 | 2007-2013 Medical Generator Shipment Summary ..... 12                              |
| TABLE 12 | 2013 Medical Generators Shipping LLRW for<br>Processing or Disposal..... 13        |
| TABLE 13 | 2007-2013 Reactor Generator Shipment Summary ..... 13                              |
| TABLE 14 | 2013 Reactor Generators Shipping LLRW for<br>Processing or Disposal..... 14        |
| TABLE 15 | Distribution by Class of LLRW Shipped by Generator<br>Category in 2013 ..... 15    |

**LIST OF TABLES**

(Continued)

|  | Page |
|--|------|
| TABLE 16 Radionuclides Held for Decay in 2013 .....  | 17   |
| TABLE 17 Types of Mixed Waste Stored On-Site at the end of 2013 .....                              | 19   |
| TABLE 18 LLRW Volume Projections (ft <sup>3</sup> ) 2014-2020.....                                 | 20   |
| TABLE 19 LLRW Volume Projections (m <sup>3</sup> ) 2014-2020.....                                  | 20   |
| TABLE 20 LLRW Activity Projections (Ci) 2014-2020 .....  | 21   |
| TABLE 21 LLRW Activity Projections (MBq) 2014-2020.....  | 21   |
| TABLE 22 Mixed Waste Volume Projections (ft <sup>3</sup> ) by Generator<br>Category 2014-2020..... | 22   |
| TABLE 23 Mixed Waste Volume Projections (m <sup>3</sup> ) by Generator<br>Category 2014-2020.....  | 22   |
| TABLE 24 Mixed Waste Activity Projections (mCi) by Generator<br>Category 2014-2020.....            | 23   |
| TABLE 25 Mixed Waste Activity Projections (MBq) by Generator<br>Category 2014-2020.....            | 23   |

## LIST OF FIGURES

|          | Page  |
|----------|---|
| Figure 1 | Number of LLRW Generators by Category 2007 – 2013..... 4                        |
| Figure 2 | 2013 LLRW Volume and Activity by Generator Category..... 5                      |
| Figure 3 | Academic Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 6     |
| Figure 4 | Fuel Cycle Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 8   |
| Figure 5 | Governmental Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 9 |
| Figure 6 | Industrial Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 10  |
| Figure 7 | Medical Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 12     |
| Figure 8 | Reactor Generator Category LLRW<br>Volume and Activity 2007 – 2013 ..... 14     |

## 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 30<sup>th</sup> 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 2013. 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

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

| <b>Multiply<br/>English Unit</b> | <b>By</b> | <b>To Obtain<br/>SI Unit</b>  |
|----------------------------------|-----------|-------------------------------|
| Cubic Foot (ft <sup>3</sup> )    | 0.02832   | Cubic Meter (m <sup>3</sup> ) |
| 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 (ft<sup>3</sup>) 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 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 (m<sup>3</sup>) 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 2013 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 shipments directly 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**

Illinois generators can dispose of waste at The EnergySolutions' Clive, Utah 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, Texas. Waste considered to be naturally occurring radioactive material (NORM) can be disposed at the US Ecology Richland, Washington 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 2013 Annual Survey**

Illinois LLRW generation in 2013 continued to demonstrate the typical variation in year to year production. The waste volume and activity both decreased from 2012. The number of generators decreased from 2012 to 2013 by 3. This continues the decline observed since 2000.

(This page intentionally left blank.)

## Chapter Two

### 2013 Annual Survey Results

There were 419 LLRW generators in Illinois during 2013, a decrease of 3 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 7 years. A description of each of the generator categories is provided below. The category with the largest number of generators is Medical with 302. 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  
2007 – 2013**

| Generator Category | 2007       | 2008       | 2009       | 2010       | 2011       | 2012       | 2013       |
|--------------------|------------|------------|------------|------------|------------|------------|------------|
| Academic           | 33         | 35         | 33         | 33         | 29         | 28         | 30         |
| Fuel Cycle         | 2          | 2          | 2          | 2          | 2          | 2          | 2          |
| Governmental       | 18         | 19         | 18         | 15         | 15         | 15         | 16         |
| Industrial         | 71         | 66         | 66         | 65         | 58         | 57         | 62         |
| Medical            | 326        | 327        | 329        | 319        | 316        | 313        | 302        |
| Reactor            | 7          | 7          | 7          | 7          | 7          | 7          | 7          |
| <b>Total</b>       | <b>457</b> | <b>456</b> | <b>455</b> | <b>441</b> | <b>427</b> | <b>422</b> | <b>419</b> |

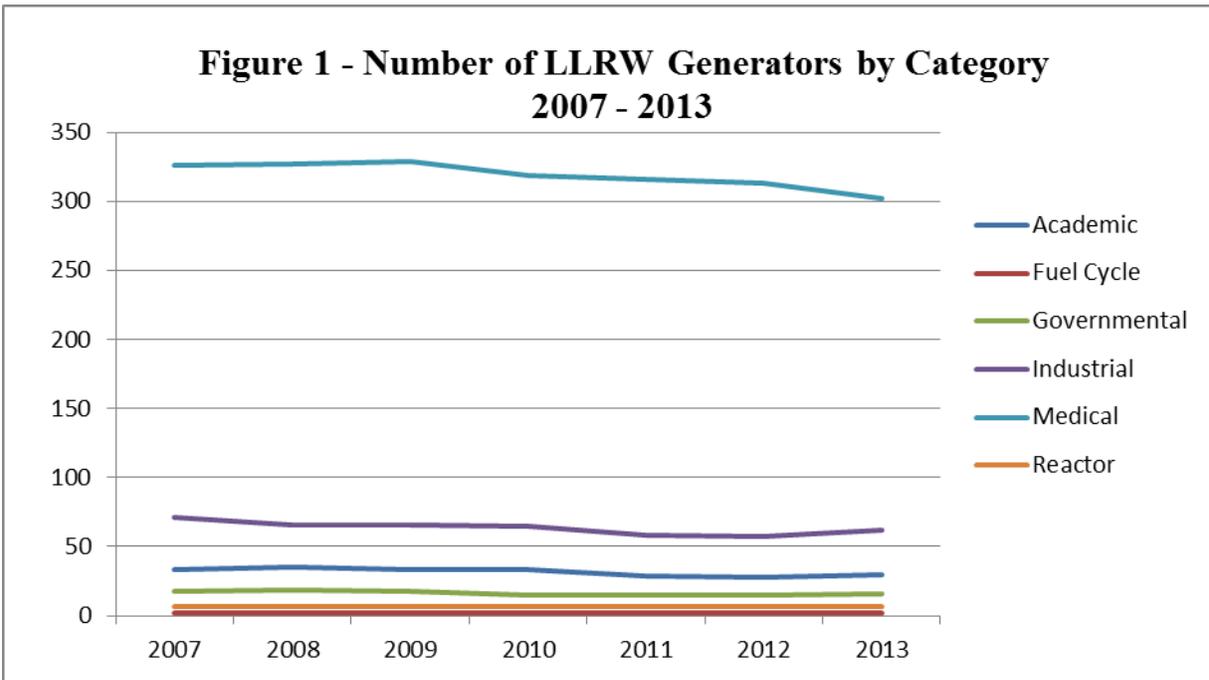
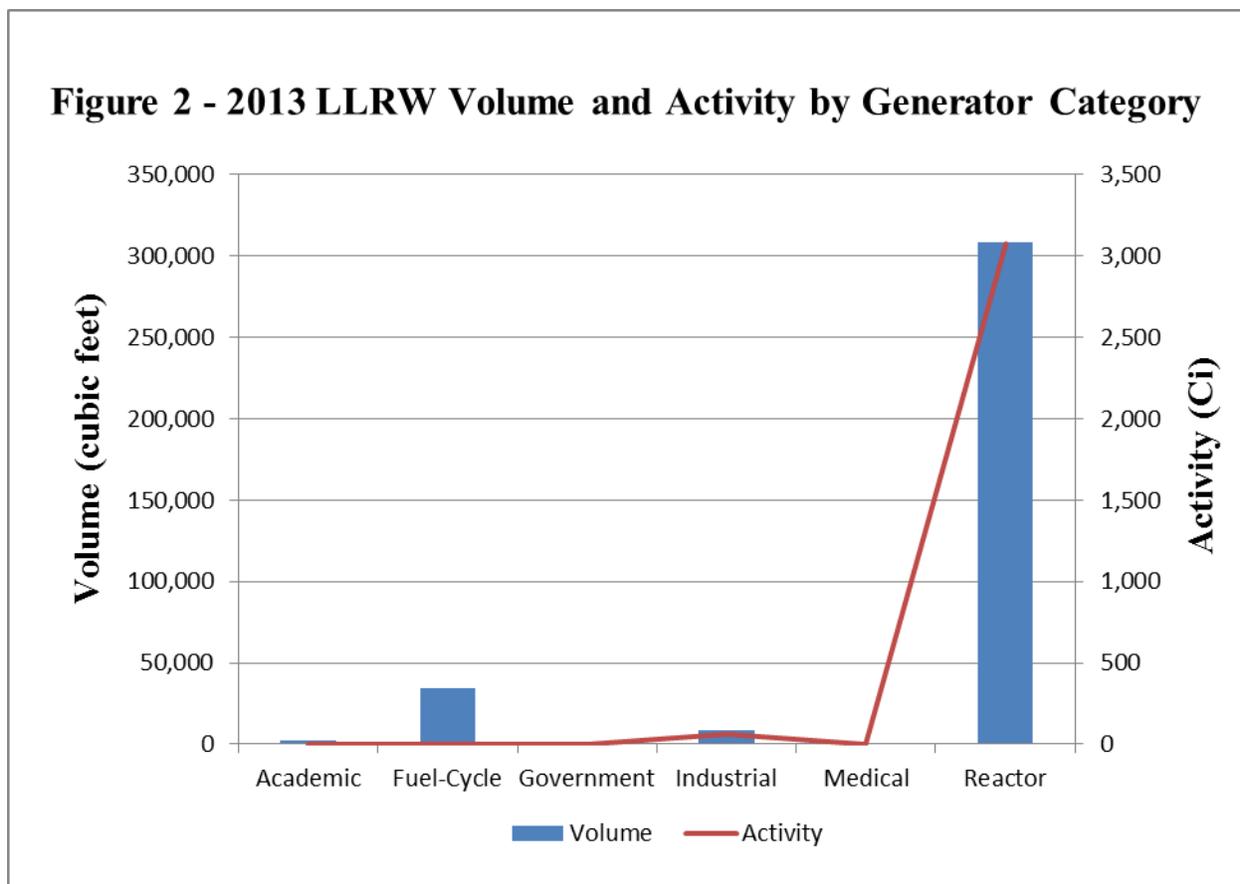


Table 2 provides a summary of the volume and activity of LLRW produced by each generator category. Figure 2 shows a graphical representation of the waste volume and activity distribution between the generator categories.

**Table 2 – 2013 Volume and Activity by Generator Category**

| Generator Category | Volume (ft <sup>3</sup> ) | Volume (m <sup>3</sup> ) | Activity (mCi)     | Activity (MBq)       |
|--------------------|---------------------------|--------------------------|--------------------|----------------------|
| Academic           | 2,316.2                   | 65.6                     | 1,017.8            | 37,657.1             |
| Fuel-Cycle         | 13,674.5                  | 387.3                    | 3,480.4            | 128,773.5            |
| Governmental       | 679.2                     | 19.2                     | 2,959.1            | 109,487.1            |
| Industrial         | 8,423.5                   | 238.6                    | 65,414.8           | 2,420,347.2          |
| Medical            | 126.5                     | 3.6                      | 1,773.2            | 65,607.7             |
| Reactor            | 331,849.5                 | 9,398.0                  | 3,329,202.3        | 123,180,484.7        |
| <b>Totals</b>      | <b>357,070.2</b>          | <b>10,112.3</b>          | <b>3,403,847.6</b> | <b>125,942,357.3</b> |

Note – Totals may not add due to rounding.



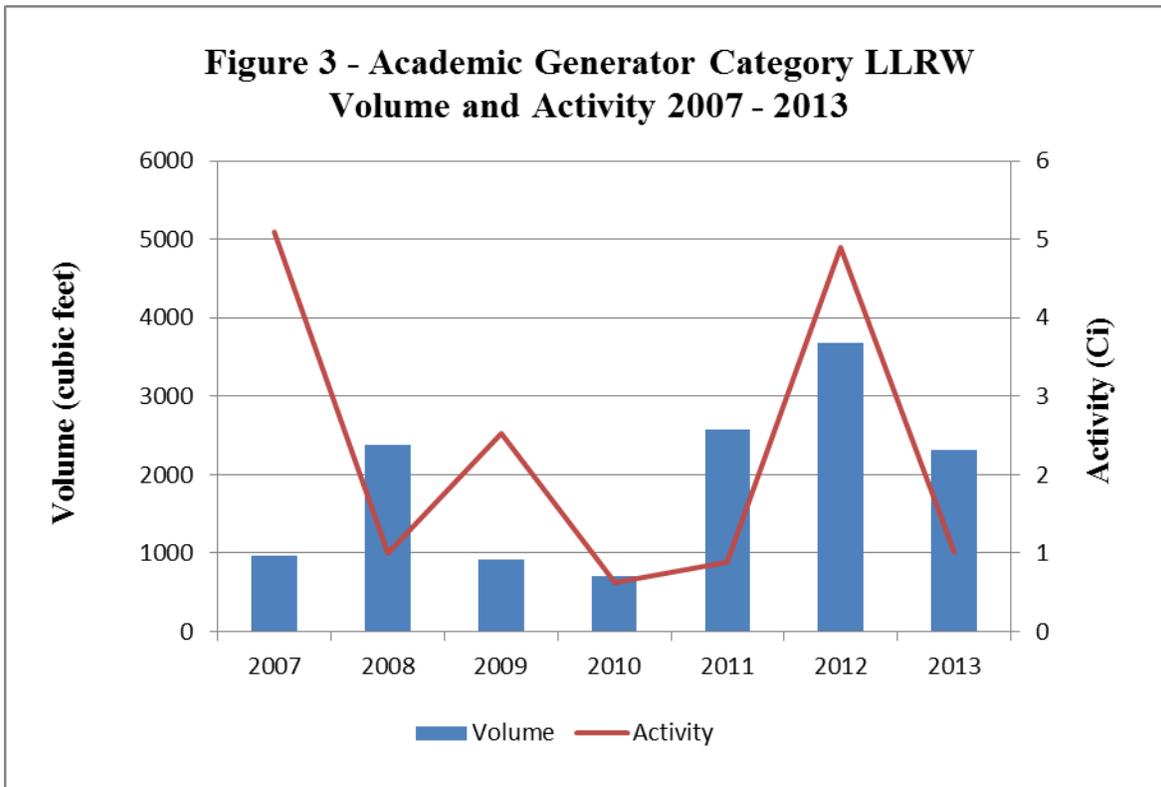
The following pages detail the responses received to the 2013 Annual Survey. The responses have been consolidated by generator category.

## Academic Category

- LLRW generated at high schools, colleges, universities, and associated research facilities.
- In 2013, 12 of 30 generators shipped LLRW.
- A decrease in waste volume and activity from the previous year was reported.

**Table 3 – 2007 – 2013 Academic Generator Shipment Summary**

| Year                      | 2007    | 2008   | 2009   | 2010   | 2011   | 2012    | 2013   |
|---------------------------|---------|--------|--------|--------|--------|---------|--------|
| # of generators           | 33      | 35     | 33     | 33     | 29     | 28      | 30     |
| # of shippers             | 9       | 12     | 11     | 10     | 9      | 8       | 12     |
| Volume (ft <sup>3</sup> ) | 962     | 2,380  | 911    | 703    | 2,579  | 3,673   | 2,316  |
| Volume (m <sup>3</sup> )  | 28      | 27     | 26     | 20     | 73     | 104     | 66     |
| Activity (mCi)            | 5,096   | 1,003  | 2,528  | 629    | 881    | 4,901   | 1,018  |
| Activity (MBq)            | 188,552 | 37,111 | 93,526 | 23,263 | 32,605 | 181,354 | 37,657 |



**Table 4 – 2013 Academic Generators Shipping LLRW for Processing or Disposal**

| Academic Generator                              | Volume             |                   | Activity       |                 |
|---|--------------------|-------------------|----------------|-----------------|
|   | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)          | (MBq)           |
| ASTELLAS Research Institute of America          | 9.2                | 0.3               | 0.9            | 33.7            |
| Augustana College                               | 0.7                | <0.1              | 8.0            | 296.0           |
| DePaul University                               | 10.3               | 0.3               | 0.1            | 1.9             |
| Fenton High School                              | 0.7                | <0.1              | <0.1           | 0.4             |
| Northwestern University                         | 389.5              | 11.0              | 187.9          | 6,953.4         |
| Rosalind Franklin University of Medical Science | 36.8               | 1.0               | 1.4            | 51.8            |
| SIU at Carbondale                               | 160.7              | 4.6               | 36.8           | 1,360.9         |
| Southern Illinois University                    | 12.9               | 0.4               | 6.1            | 223.9           |
| The University of Chicago                       | 245.4              | 7.0               | 458.1          | 16,951.2        |
| U of I at Urbana-Champaign                      | 1,231.6            | 34.9              | 295.9          | 10,947.6        |
| University of Illinois                          | 4.1                | 0.1               | <0.1           | <0.1            |
| University of Illinois at Chicago               | <u>214.4</u>       | <u>6.1</u>        | <u>22.6</u>    | <u>836.6</u>    |
| <b>Total</b>                                    | <b>2,316.2</b>     | <b>65.6</b>       | <b>1,017.8</b> | <b>37,657.1</b> |

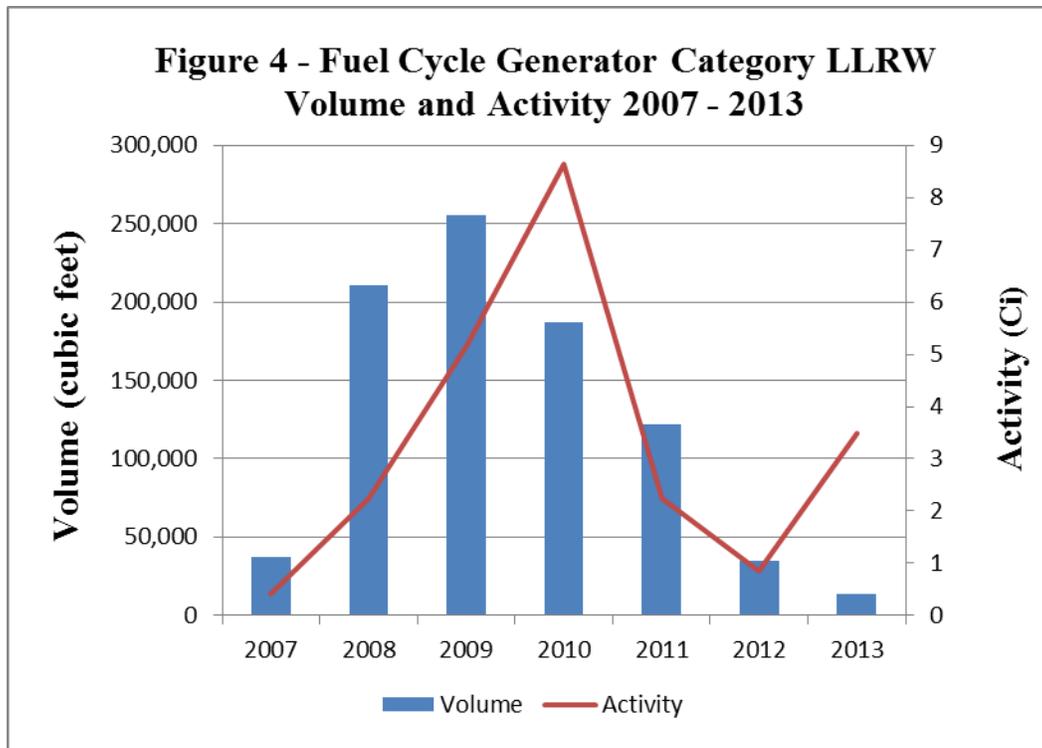
Note – Totals may not add due to rounding.

### Fuel Cycle Category

- This category includes LLRW generators whose operations are part of the nuclear fuel cycle.
- There was a decrease in waste volume and an increase in activity reported in 2013 as compared to 2012.

**Table 5 – 2007 – 2013 Fuel Cycle Generator Shipment Summary**

| Year                      | 2007   | 2008    | 2009    | 2010    | 2011    | 2012   | 2013    |
|---------------------------|--------|---------|---------|---------|---------|--------|---------|
| # of generators           | 2      | 2       | 2       | 2       | 2       | 2      | 2       |
| # of shippers             | 1      | 1       | 1       | 2       | 2       | 1      | 1       |
| Volume (ft <sup>3</sup> ) | 37,391 | 210,426 | 255,614 | 187,167 | 122,200 | 34,633 | 13,675  |
| Volume (m <sup>3</sup> )  | 1,059  | 5,959   | 6,389   | 5,301   | 3,461   | 981    | 387     |
| Activity (mCi)            | 400    | 2,248   | 5,175   | 8,648   | 2,245   | 852    | 3,480   |
| Activity (MBq)            | 14,800 | 83,176  | 191,465 | 319,969 | 83,045  | 31,541 | 128,773 |



**Table 6 – 2013 Fuel Cycle Generators Shipping LLRW for Processing or Disposal**

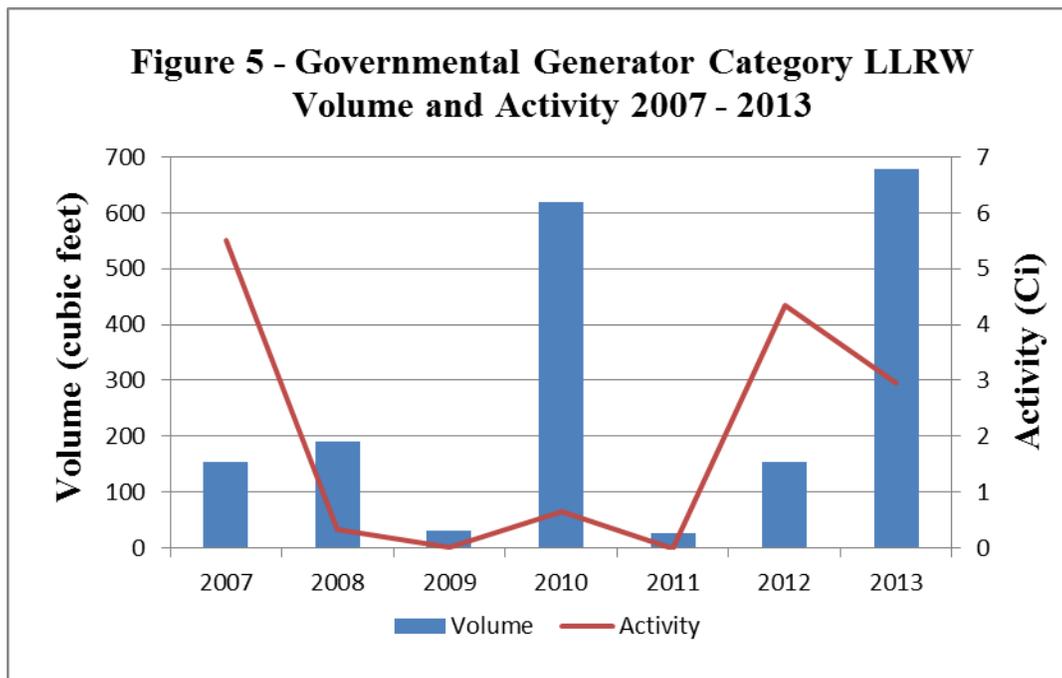
| Fuel Cycle Generator         | Volume             |                   | Activity       |                  |
|------------------------------|--------------------|-------------------|----------------|------------------|
|                              | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)          | (MBq)            |
| Honeywell International Inc. | <u>13,674.5</u>    | <u>387.3</u>      | <u>3,480.4</u> | <u>128,773.5</u> |
| <b>Total</b>                 | <u>13,674.5</u>    | <u>387.3</u>      | <u>3,480.4</u> | <u>128,773.5</u> |

### Governmental Category

- This category includes LLRW generated by city, state, and federal governmental entities, including Veterans Affairs hospitals.
- In 2013, 4 of 16 generators shipped LLRW.
- There was a significant increase in volume and a decrease in activity generation reported in 2013 as compared to 2012.
- There was a decrease in waste volume and an increase in activity reported in 2013 as compared to 2012.

**Table 7 – 2007 – 2013 Governmental Generator Shipment Summary**

| Year                      | 2007    | 2008   | 2009 | 2010   | 2011 | 2012    | 2013    |
|---------------------------|---------|--------|------|--------|------|---------|---------|
| # of generators           | 18      | 19     | 18   | 15     | 15   | 15      | 16      |
| # of shippers             | 4       | 4      | 2    | 1      | 2    | 4       | 4       |
| Volume (ft <sup>3</sup> ) | 154     | 191    | 30   | 620    | 27   | 153     | 679     |
| Volume (m <sup>3</sup> )  | 4       | 6      | 1    | 18     | 1    | 4       | 19      |
| Activity (mCi)            | 5,498   | 335    | 1    | 644    | <1   | 4,352   | 2,959   |
| Activity (MBq)            | 203,426 | 12,395 | 39   | 23,823 | 8    | 161,024 | 109,487 |



**Table 8 – 2013 Governmental Generators Shipping LLRW for Processing or Disposal**

| Governmental Generator             | Volume             |                   | Activity       |                  |
|------------------------------------|--------------------|-------------------|----------------|------------------|
|                                    | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)          | (MBq)            |
| Department of the Army             | 137                | 3.9               | 2,658.2        | 98,352.3         |
| Department of Veterans Affairs     | 0.7                | <0.1              | <0.1           | 217.6            |
| U.S. Nuclear Regulatory Commission | 1.5                | <0.1              | <0.1           | 2.2              |
| Village of Lake in the Hills       | <u>540.0</u>       | <u>15.3</u>       | <u>295.0</u>   | <u>10,915</u>    |
| <b>Total</b>                       | <u>679.2</u>       | <u>19.2</u>       | <u>2,959.1</u> | <u>109,487.1</u> |

Note – Totals may not add due to rounding.

## Industrial Category

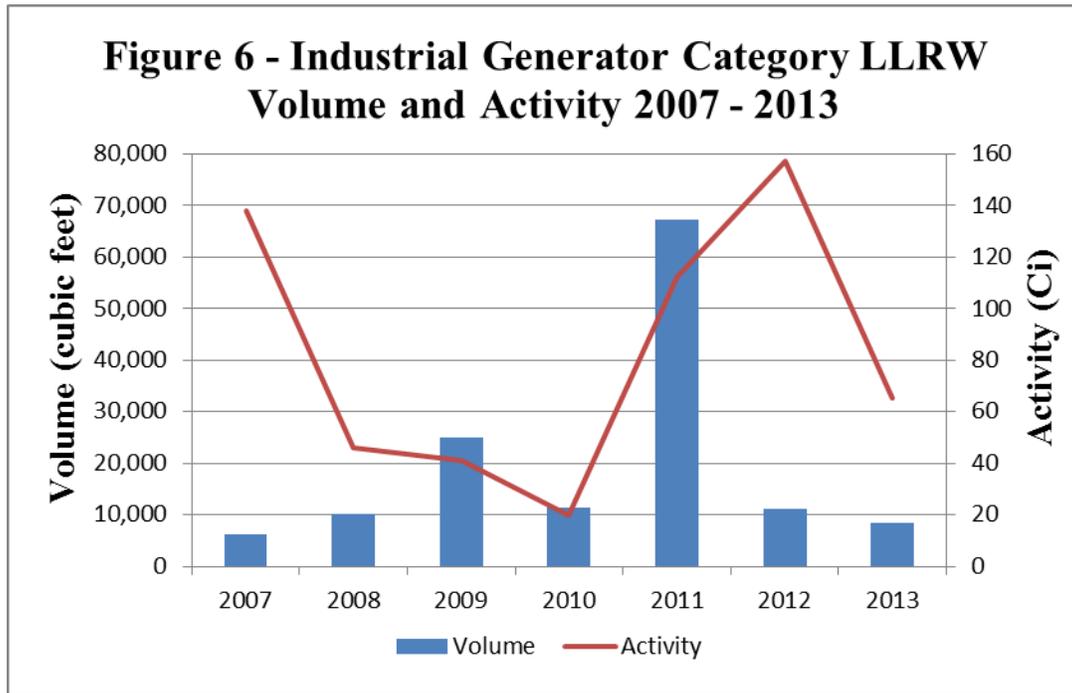
- This category includes LLRW generated by private entities that provide products or services to the private and public sectors.
- In 2013, 16 of 62 generators shipped LLRW.
- There was a decrease in waste volume and a significant decrease in activity reported in 2013 as compared to 2012.

**Table 9 – 2007 – 2013 Industrial Generator Shipment Summary**

| Year                      | 2007  | 2008   | 2009   | 2010   | 2011   | 2012   | 2013  |
|---------------------------|-------|--------|--------|--------|--------|--------|-------|
| # of generators           | 71    | 66     | 66     | 65     | 58     | 57     | 62    |
| # of shippers             | 15    | 17     | 17     | 15     | 13     | 9      | 16    |
| Volume (ft <sup>3</sup> ) | 6,194 | 10,072 | 24,865 | 11,295 | 67,298 | 11,184 | 8,424 |
| Volume (m <sup>3</sup> )  | 176   | 285    | 704    | 320    | 1,906  | 317    | 239   |
| Activity (Ci)             | 138   | 46     | 41     | 20     | 112    | 156    | 65    |
| Activity (GBq)            | 5,140 | 1,705  | 1,515  | 738    | 4,153  | 5,803  | 2,420 |

Please note the units for activity are in Curies and gigaBecquerels.

1 Ci = 1,000 mCi; 1 GBq = 1,000 MBq



**Table 10 – 2013 Industrial Generators Shipping LLRW for Processing or Disposal**

| Industrial Generator              | Volume             |                   | Activity        |                    |
|-----------------------------------|--------------------|-------------------|-----------------|--------------------|
|                                   | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)           | (MBq)              |
| Abbott Laboratories               | 15.0               | 0.4               | <0.1            | <0.1               |
| AbbVie, Inc.                      | 439.5              | 12.4              | 62,526.2        | 2,313,467.6        |
| APL Engineered Materials, Inc.    | 7.5                | 0.2               | <0.1            | 0.4                |
| Baxter Health Care Corporation    | 17.0               | 0.5               | 59.4            | 2,196.7            |
| BP-Naperville Campus              | 12.7               | 0.4               | 10.3            | 381.1              |
| Celanese                          | 0.7                | <0.1              | 15.4            | 569.8              |
| Eichrom Technologies, LLC         | 26.3               | 0.7               | <0.1            | 0.7                |
| GE Healthcare                     | 605.0              | 17.1              | <0.1            | <0.1               |
| Landauer, Inc.                    | 1.8                | 0.4               | 845.7           | 31,289.4           |
| LIXI, Inc.                        | 1.0                | 0.0               | 659.2           | 24,390.0           |
| Perkin Elmer Life Sciences        | 117.1              | 3.3               | 3.4             | 124.7              |
| Richardson Electronics, LTD       | 4.0                | 0.1               | <0.1            | 1.1                |
| Unitech Services Group, Inc.      | 3,600.0            | 101.6             | 937.6           | 34,689.7           |
| United Airlines                   | 6.0                | 0.2               | <0.1            | 1.1                |
| Water Remediation Technology, LLC | 3,528.0            | 99.9              | 28.7            | 1,061.9            |
| Woodhaven Utilities               | 42.0               | 1.2               | 329.0           | 12,173.0           |
| <b>Total</b>                      | <b>8,423.5</b>     | <b>238.6</b>      | <b>65,414.8</b> | <b>2,420,347.2</b> |

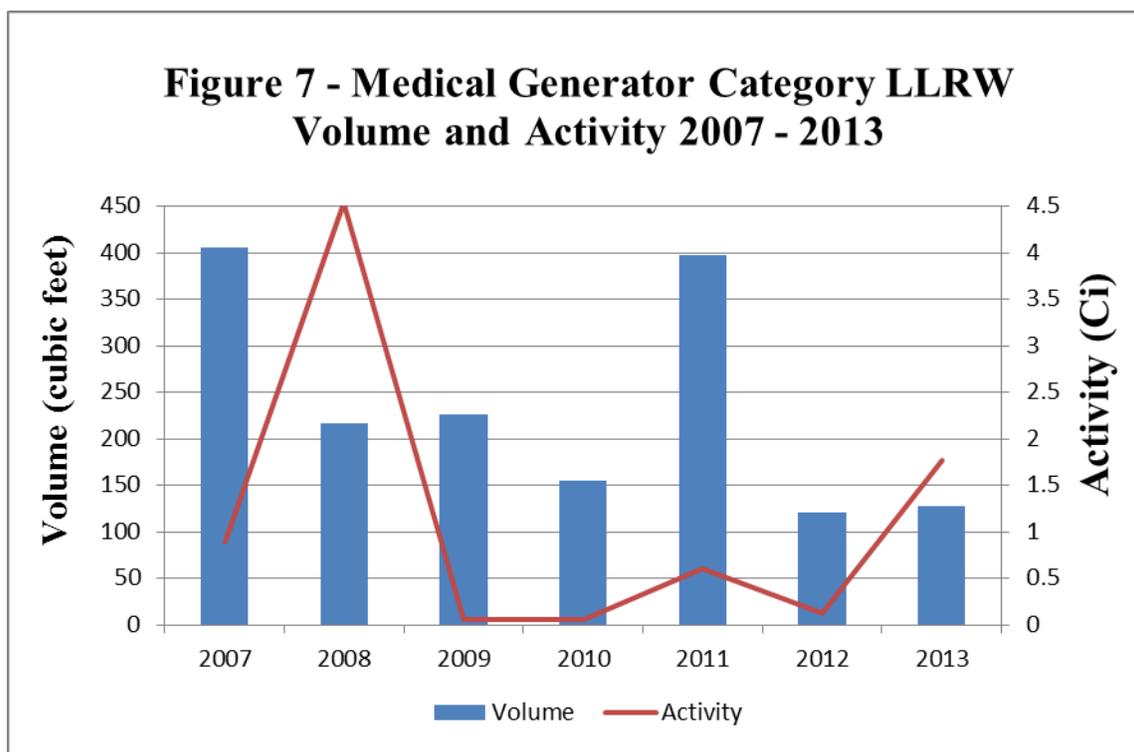
Note – Totals may not add due to rounding.

### Medical Category

- This category includes LLRW generated by hospitals, medical centers, clinics, laboratories, and private medical offices.
- In 2013, 7 of the 302 medical generators shipped LLRW.
- The majority of medical generators don't generate waste that requires offsite management.
- There was a slight increase in waste volume and a significant increase in activity reported in 2013 as compared to 2012.

**Table 11 – 2007 – 2013 Medical Generator Shipment Summary**

| Year                      | 2007   | 2008    | 2009  | 2010  | 2011   | 2012  | 2013   |
|---------------------------|--------|---------|-------|-------|--------|-------|--------|
| # of generators           | 326    | 327     | 329   | 319   | 316    | 313   | 302    |
| # of shippers             | 4      | 16      | 8     | 7     | 9      | 7     | 7      |
| Volume (ft <sup>3</sup> ) | 405    | 217     | 226   | 155   | 397    | 120   | 127    |
| Volume (m <sup>3</sup> )  | 11     | 5       | 6     | 4     | 11     | 3     | 4      |
| Activity (mCi)            | 894    | 4,530   | 62    | 50    | 605    | 122   | 1,773  |
| Activity (MBq)            | 33,078 | 167,610 | 2,296 | 1,854 | 22,377 | 4,500 | 65,608 |



**Table 12 – 2013 Medical Generators Shipping LLRW for Processing or Disposal**

| Medical Generator                        | Volume             |                   | Activity    |                |
|--|--------------------|-------------------|-------------|----------------|
|  | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)       | (MBq)          |
| Advocate Illinois Masonic Medical Center | 4.5                | 0.1               | 657.8       | 24,337.5       |
| Carle Foundation Hospital                | 4.4                | 0.1               | 408.5       | 15,114.1       |
| CGH Medical Center                       | 0.4                | <0.1              | 479.8       | 17,751.1       |
| Decatur Memorial Hospital                | 1.4                | <0.1              | 149.4       | 5,528.9        |
| Northwestern Memorial Hospital           | 112.5              | 3.2               | 2.6         | 97.3           |
| Orthopedic Analysis, LLC                 | 2.7                | <0.1              | 3.0         | 111.0          |
| St. Alexius Medical Center               | <u>0.7</u>         | <u>&lt;0.1</u>    | <u>72.1</u> | <u>2,667.7</u> |
| <b>Total</b>                             | 126.5              | 3.6               | 1,773.2     | 65,607.7       |

Note – Totals may not add due to rounding.

### Reactor Category

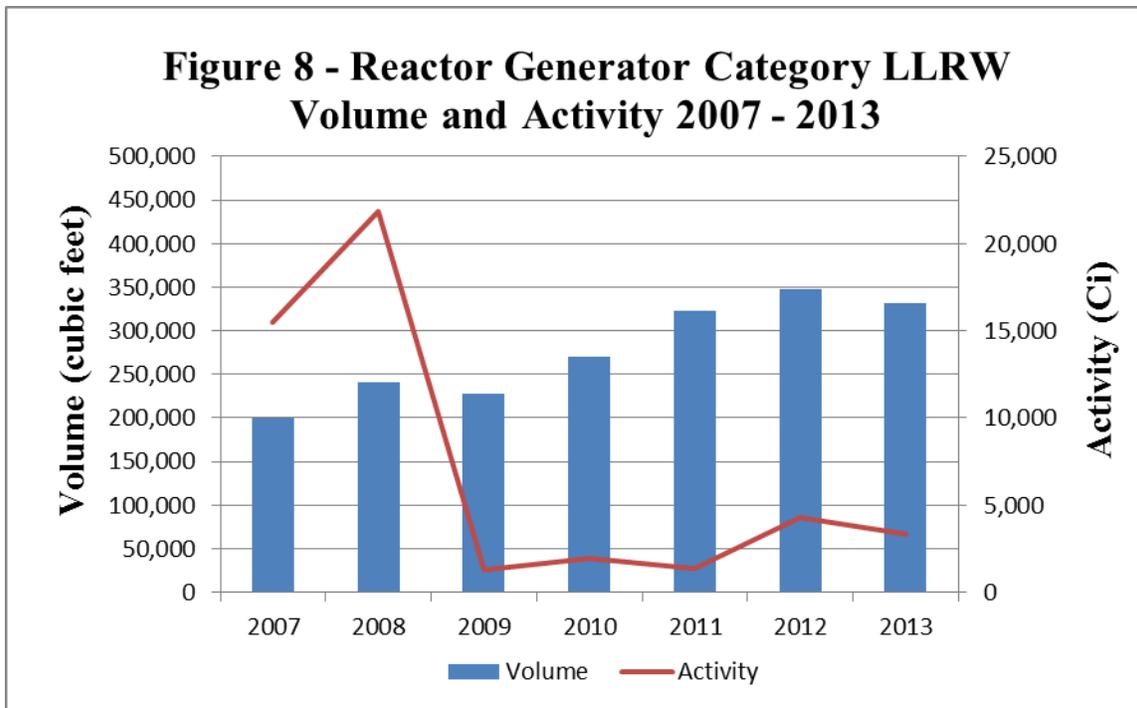
- This category includes LLRW generated at the nuclear power stations.
- All 7 generators shipped waste in 2013.
- The waste volume and the activities decreased in 2013.
- Waste volume and activities will vary substantially from year to year depending on the number of stations conducting refueling outages or other maintenance activities.
- The Zion Station is being decommissioned.

**Table 13 – 2007 – 2013 Reactor Generator Shipment Summary**

| Year                      | 2007    | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|
| # of generators           | 7       | 7       | 7       | 7       | 7       | 7       | 7       |
| # of shippers             | 7       | 7       | 7       | 6       | 7       | 7       | 7       |
| Volume (ft <sup>3</sup> ) | 199,043 | 240,475 | 226,885 | 270,393 | 322,928 | 348,055 | 331,850 |
| Volume (m <sup>3</sup> )  | 5,637   | 6,810   | 6,425   | 7,658   | 9,429   | 9,857   | 9,398   |
| Activity (Ci)             | 15,492  | 21,846  | 1,261   | 1,911   | 1,363   | 4,248   | 3,329   |
| Activity (TBq)            | 573     | 808     | 47      | 71      | 50      | 157     | 123     |

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 – 2013 Reactor Generators Shipping LLRW for Processing or Disposal**

| Reactor Generator | Volume             |                   | Activity           |                     |
|-------------------|--------------------|-------------------|--------------------|---------------------|
|                   | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (mCi)              | (MBq)               |
| Braidwood         | 60,335.5           | 1,708.7           | 743,361.7          | 27,504,383.6        |
| Byron             | 26,366.4           | 746.7             | 15,614.0           | 577,717.2           |
| Clinton           | 23,529.0           | 666.3             | 256,488.9          | 9,490,090.4         |
| Dresden           | 37,946.0           | 1,074.6           | 127,103.6          | 4,702,831.7         |
| LaSalle           | 44,292.4           | 1,254.4           | 113,155.2          | 4,186,741.7         |
| Quad Cities       | 44,275.2           | 1,253.9           | 311,138.3          | 11,512,115.3        |
| Zion Station      | <u>95,105.1</u>    | <u>2,693.4</u>    | <u>1,762,340.7</u> | <u>65,206,604.8</u> |
| <b>Total</b>      | 331,849.5          | 9,398.0           | 3,329,202.3        | 123,180,484.7       |

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. 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 2013**

| Generator Category | Class A Volume     |                   | Class B Volume     |                   | Class C Volume     |                   | Total Category Volume |                   |
|--------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|-----------------------|-------------------|
|                    | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (ft <sup>3</sup> ) | (m <sup>3</sup> ) | (ft <sup>3</sup> )    | (m <sup>3</sup> ) |
| Academic           | 2,310.1            | 65.4              | 3.8                | <0.1              | 2.1                | <0.1              | 2,316.0               | 65.6              |
| Fuel-Cycle         | 13,674.5           | 387.3             | 0.0                | 0.0               | 0.0                | 0.0               | 13,674.5              | 387.3             |
| Governmental       | 679.5              | 19.2              | 0.0                | 0.0               | 0.7                | <0.1              | 680.2                 | 19.2              |
| Industrial         | 8,415.7            | 238.3             | 3.6                | <0.1              | 0.0                | 0.0               | 8,423.5               | 238.6             |
| Medical            | 115.9              | 3.3               | 10.6               | <0.1              | 0.0                | 0.0               | 126.5                 | 3.6               |
| Reactor            | <u>330,821.2</u>   | <u>9,368.9</u>    | <u>908.0</u>       | <u>25.7</u>       | <u>120.3</u>       | <u>3.4</u>        | <u>331,849.5</u>      | <u>9,398.0</u>    |
| <b>Total</b>       | 356,017.0          | 10,082.4          | 926.0              | 26.2              | 123.1              | 3.5               | 357,070.2             | 10,112.3          |

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. It is anticipated that the volume of Class B and Class C waste shipped for disposal will increase in the future. 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 2013, ten academic facilities, three governmental, eight industrial facilities, and fifteen 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 2013**

| Radionuclide | Half-Life     | Academic | Governmental | Industrial | Medical | Total |
|--------------|---------------|----------|--------------|------------|---------|-------|
| Ar-41        | 1.8 Hours     |          |              | 1          |         | 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     |          |              | 1          | 1       | 2     |
| 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 |          |              | 5          | 33      | 38    |
| Ga-67        | 3.3 Days      |          |              | 5          | 75      | 80    |
| Ga-68        | 68.3 Minutes  |          |              |            | 1       | 1     |
| I-123        | 13.2 Hours    |          | 2            | 4          | 109     | 115   |
| I-125        | 60.1 Days     | 2        |              |            | 14      | 16    |
| I-131        | 8 Days        |          |              | 7          | 76      | 83    |
| I-133        | 20.8 Hours    |          |              |            | 1       | 1     |
| I-135        | 6.68 Hours    |          |              | 1          |         | 1     |
| In-111       | 2.8 Days      |          | 1            | 6          | 89      | 96    |
| 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        |              |            | 1       | 4     |
| P-33         | 25.4 Days     |          |              |            | 1       | 1     |
| Pd-103       | 17 Days       |          |              |            | 7       | 7     |
| Ra-222       | 38 Seconds    |          |              |            | 1       | 1     |
| Ra-223       | 11.4 Days     |          |              | 1          | 10      | 11    |
| Rb-86        | 18.7 Days     | 1        |              |            |         | 1     |
| S-35         | 87.4 Days     | 1        |              |            |         | 1     |
| Sb-122       | 67 Hours      |          |              | 1          |         | 1     |
| Sm-153       | 47 Hours      |          |              | 3          | 10      | 13    |
| Sr-89        | 50.6 Days     |          |              | 4          | 5       | 9     |
| Sr-91        | 9.67 Hours    |          |              | 1          |         | 1     |
| Sr-92        | 2.71 Hours    |          |              | 1          |         | 1     |
| Tc-99m       | 6 Hours       | 2        | 4            | 6          | 255     | 267   |
| Tl-201       | 73.1 Hours    |          |              | 6          | 138     | 144   |
| Xe-123       | 2.14 Hours    |          |              |            | 1       | 1     |
| Xe-133       | 5.2 Days      |          | 2            | 5          | 67      | 74    |
| Xe-133m      | 2.2 Days      |          |              |            | 1       | 1     |
| Y-90         | 64.1 Hours    | 1        |              | 4          | 8       | 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 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 2013**

| Waste Type                      | Volume             |                   | Radionuclides   |
|---------------------------------|--------------------|-------------------|---|
|                                 | (ft <sup>3</sup> ) | (m <sup>3</sup> ) |   |
| Lead                            |                    |                   |   |
| Contaminated Lead               | 7.4                | 0.2               | C0-60, Cs-137, Mn-54  |
| Metals                          |                    |                   |   |
| Mercury                         | 4.2                | 0.1               | Co-60, Cs-134, Cs-137, Mn-54  |
| Arsenic                         | 1.0                | <0.1              | U-Nat   |
| Other                           | 9.7                | 0.3               | Am-241, H-3Ni-63, PN-147, Ra-226, Th-232  |
| Scintillation Fluids            |                    |                   |   |
| Toluene                         | 10.5               | 0.3               | C-14, Fe-55, H-3, S-35, Th-232, U-238   |
| Xylene                          | 7.5                | 0.2               | C0-60, Cs-134, Cs-137, Mn-54  |
| Other                           | 19.3               | 0.5               | C-14, H-3   |
| Solvents & Other Organic Fluids |                    |                   |   |
| Other                           | 55.0               | 1.6               | C-14, Co-58, Co-60, Cs-134, Cs-137, Fe-55, H-3Mn-54, Ni-63, D-35, Th-232, U-238 |
| Alkaline Liquids                |                    |                   |   |
| Other                           | 37.5               | 1.1               | Co-60, Cs-134, Cs-137, Mn-54  |
| Other                           | <u>50.1</u>        | <u>1.4</u>        | Co-57, Co-60, Cs-134, Cs-137, H-3, Mn-54, P-32, U-Nat                           |
| <b>Total</b>                    | <b>202.2</b>       | <b>5.7</b>        |   |

Note-Totals may not add due to rounding.

## Chapter Three

### Waste Projections

The 2013 Annual Survey required generators to project the amount of LLRW they expect to produce or possess between 2014 and 2020. 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 underestimated 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<sup>3</sup>)  
2014 - 2020**

| Year         | 2014           | 2015           | 2016             | 2017           | 2018           | 2019           | 2020           |
|--------------|----------------|----------------|------------------|----------------|----------------|----------------|----------------|
| Academic     | 507            | 337            | 347              | 339            | 342            | 359            | 377            |
| Fuel Cycle   | 500            | 500            | 500              | 500            | 500            | 500            | 500            |
| Governmental | 24             | 12             | 14               | 2              | 2              | 2              | 2              |
| Industrial   | 5,535          | 5,539          | 5,586            | 5,686          | 5,604          | 5,636          | 5,654          |
| Medical      | 458            | 303            | 213              | 213            | 213            | 213            | 213            |
| Reactor      | <u>241,686</u> | <u>444,494</u> | <u>1,235,273</u> | <u>335,174</u> | <u>491,473</u> | <u>153,174</u> | <u>150,273</u> |
| <b>Total</b> | 248,861        | 451,185        | 1,241,933        | 341,815        | 498,134        | 159,885        | 157,019        |

Note - Totals may not add due to rounding.

**Table 19 – LLRW Volume Projections (m<sup>3</sup>)  
2014 - 2020**

| Year         | 2014           | 2015            | 2016            | 2017           | 2018            | 2019           | 2020           |
|--------------|----------------|-----------------|-----------------|----------------|-----------------|----------------|----------------|
| Academic     | 14.4           | 9.5             | 9.8             | 9.6            | 9.7             | 10.2           | 10.7           |
| Fuel Cycle   | 18.4           | 14.2            | 14.2            | 14.2           | 14.2            | 14.2           | 14.2           |
| Governmental | 0.7            | 0.3             | 0.4             | 0.1            | 0.1             | 0.1            | 0.1            |
| Industrial   | 156.7          | 156.9           | 158.2           | 158.2          | 158.7           | 159.6          | 160.1          |
| Medical      | 13.0           | 8.6             | 6.0             | 6.0            | 6.0             | 6.0            | 6.0            |
| Reactor      | <u>6,844.6</u> | <u>12,588.1</u> | <u>34,982.9</u> | <u>9,492.1</u> | <u>13,918.5</u> | <u>4,337.9</u> | <u>4,255.7</u> |
| <b>Total</b> | 7,047.7        | 12,777.6        | 35,171.6        | 9,680.2        | 14,107.2        | 4,527.9        | 4,446.8        |

Note – Totals may not add due to rounding.

**Table 20 – LLRW Activity Projections (mCi)  
2014 - 2020**

| Year         | 2014              | 2015              | 2016             | 2017             | 2018             | 2019             | 2020             |
|--------------|-------------------|-------------------|------------------|------------------|------------------|------------------|------------------|
| Academic     | 632               | 462               | 477              | 487              | 474              | 479              | 512              |
| Fuel Cycle   | 120,150           | 150               | 150              | 150              | 150              | 150              | 150              |
| Governmental | 17,102            | 15,002            | 50,002           | 17,001           | 17,001           | 15,001           | 17,001           |
| Industrial   | 10,464            | 70,525            | 10,775           | 76,025           | 11,275           | 81,525           | 11,775           |
| Medical      | 35                | 31                | 31               | 31               | 31               | 31               | 31               |
| Reactor      | <u>72,205,200</u> | <u>11,345,800</u> | <u>9,060,200</u> | <u>9,050,700</u> | <u>9,055,000</u> | <u>9,047,700</u> | <u>6,527,200</u> |
| <b>Total</b> | 72,353,583        | 11,431,969        | 9,121,635        | 9,144,393        | 9,083,931        | 9,144,886        | 6,556,669        |

**Table 21 – LLRW Activity Projections (MBq)  
2014 - 2020**

| Year         | 2014                 | 2015               | 2016               | 2017               | 2018               | 2019               | 2020               |
|--------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Academic     | 23,384               | 17,094             | 17,649             | 18,019             | 17,538             | 17,723             | 18,944             |
| Fuel Cycle   | 4,445,550            | 5,550              | 5,550              | 5,550              | 5,550              | 5,550              | 5,550              |
| Governmental | 632,774              | 555,074            | 1,850,074          | 629,037            | 629,037            | 555,037            | 629,037            |
| Industrial   | 387,168              | 2,609,425          | 398,675            | 2,812,925          | 417,175            | 3,016,425          | 435,675            |
| Medical      | 1,295                | 1,147              | 1,147              | 1,147              | 1,147              | 1,147              | 1,147              |
| Reactor      | <u>2,671,592,400</u> | <u>419,794,600</u> | <u>335,227,400</u> | <u>334,875,900</u> | <u>335,035,000</u> | <u>334,764,900</u> | <u>241,506,400</u> |
| <b>Total</b> | 2,677,082,571        | 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 2013 Annual Survey asked generators to project the volume and activity of mixed waste they thought they would produce between 2014 and 2020. 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<sup>3</sup>) by Generator Category  
2014 - 2020**

| Year         | 2014      | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     |
|--------------|-----------|----------|----------|----------|----------|----------|----------|
| Academic     | 140       | 20       | 20       | 20       | 20       | 20       | 20       |
| Fuel Cycle   | 0         | 0        | 0        | 0        | 0        | 0        | 0        |
| Government   | 2         | 2        | 4        | 2        | 2        | 2        | 2        |
| Industrial   | 101       | 106      | 116      | 122      | 127      | 132      | 142      |
| Medical      | 8         | 0        | 8        | 0        | 8        | 0        | 8        |
| Reactor      | <u>46</u> | <u>8</u> | <u>8</u> | <u>8</u> | <u>8</u> | <u>8</u> | <u>8</u> |
| <b>Total</b> | 297       | 136      | 156      | 152      | 165      | 162      | 180      |

**Table 23 – Mixed Waste Volume Projections (m<sup>3</sup>) by Generator Category  
2014 - 2020**

| Year         | 2014     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     |
|--------------|----------|----------|----------|----------|----------|----------|----------|
| Academic     | 4        | 1        | 1        | 1        | 1        | 1        | 1        |
| Fuel Cycle   | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Government   | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Industrial   | 3        | 3        | 3        | 3        | 4        | 4        | 4        |
| Medical      | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Reactor      | <u>1</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> |
| <b>Total</b> | 8        | 4        | 4        | 4        | 5        | 5        | 5        |

Note – Totals may not add due to rounding.

**Table 24 – Mixed Waste Activity Projections (mCi) by Generator Category  
2014 - 2020**

| Year         | 2014     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     |
|--------------|----------|----------|----------|----------|----------|----------|----------|
| Academic     | 45       | 35       | 20       | 20       | 20       | 20       | 20       |
| Fuel Cycle   | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Government   | 17,000   | 15,000   | 50,000   | 17,000   | 17,000   | 15,000   | 17,000   |
| Industrial   | 1,207    | 1,257    | 1,307    | 1,353    | 1,403    | 1,453    | 1,503    |
| Medical      | 0        | 0        | 0        | 0        | 0        | 0        | 0        |
| Reactor      | <u>7</u> | <u>4</u> | <u>4</u> | <u>4</u> | <u>4</u> | <u>4</u> | <u>4</u> |
| <b>Total</b> | 18,259   | 16,296   | 51,331   | 18,377   | 18,427   | 16,477   | 18,527   |

Note – Totals may not add due to rounding.

**Table 25 – Mixed Waste Volume Projections (MBq) by Generator Category  
2014 - 2020**

| Year         | 2014       | 2015       | 2016       | 2017       | 2018       | 2019       | 2020       |
|--------------|------------|------------|------------|------------|------------|------------|------------|
| Academic     | 1,665      | 1,295      | 740        | 740        | 740        | 740        | 740        |
| Fuel Cycle   | 0          | 0          | 0          | 0          | 0          | 0          | 0          |
| Government   | 629,000    | 555,000    | 1,850,000  | 629,000    | 629,000    | 555,000    | 629,000    |
| Industrial   | 44,640     | 46,490     | 48,341     | 50,043     | 51,893     | 53,743     | 55,593     |
| Medical      | 19         | 19         | 19         | 0          | 19         | 0          | 19         |
| Reactor      | <u>263</u> | <u>148</u> | <u>148</u> | <u>148</u> | <u>148</u> | <u>148</u> | <u>148</u> |
| <b>Total</b> | 675,587    | 602,952    | 1,899,247  | 679,931    | 681,799    | 609,631    | 685,499    |

Note – Totals may not add due to rounding.