LOW-LEVEL RADIOACTIVE WASTE TREND REPORT

2014

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Table of Contents

ABSTRACT

This report presents information on trending and analysis of the volume and radioactivity of the low level radioactive waste (LLRW) reported to the Massachusetts Department of Public Health, Bureau of Environmental Health, Radiation Control Program (RCP) in the annual survey as generated in calendar years 2010-2014. The LLRW surveys are administered to RCP and Nuclear Regulatory Commission (NRC) licensees located in Massachusetts. The survey also provides information on the potential impact to licensees should access to out-of state LLRW disposal facilities be denied.

The four LLRW classes in this report are: A, B, and C as described in 105 CMR 120.299, and High Volume, Low Activity (HVLA) waste as described in 345 CMR 1.13. As appropriate, the LLRW is further classified into five waste generator categories: (1) Academic, (2) Commercial, (3) Government, (4) Health, and (5) Utility; and six Facility Types: (1) Federal Agency, (2) State Agency, (3) State Education, (4) Municipality, (5) Private, Profit, and (6) Private, Non-Profit.

EXECUTIVE SUMMARY

This report summarizes the data on low-level radioactive waste (LLRW) generated in the state of Massachusetts for calendar years 2010-2014. This report is compiled from the annual low-level waste survey from radioactive material licensees.

The total volume of LLRW generated in Massachusetts from 2010-2014 was 880,740 cubic feet (ft3), and the total LLRW activity was approximately 60,839 curies (Ci).

LLRW Volume Generated from 2010-2014 (ft3)

Class	2010	2011	2012	2013	2014
A	27,326	47,396	31,039	51,717	33,028
B	386	418	586	249	467
C	30	52	37	97	87
HVLA	412,623	265,074	5,521	48	4,559
TOTAL	**440,365**	**312,940**	**37,183**	**52,111**	**38,141**

LLRW Activity Generated from 2010-2014 (Ci)

Class	2010	2011	2012	2013	2014
A	784	1,105	860	718	627
B	11,484	9,368	10,551	16,425	8,563
C	55	57	48	71	68
HVLA	39	9.87	1.11	1.10	5.64
TOTAL	**12,362**	**10,539.87**	**11,460.11**	**17,215.10**	**9,263.64**

The volume and radioactivity generated from 2010-2014 varied due to one-time-only events such as decommissioning projects, source manufacturing projects or nuclear power plant outages. For example, 2010 saw a large increase of LLRW from the Shpack landfill, a National Priority List Superfund site cleanup headed by the U.S. Army Corps of Engineers.

Additionally, scheduled plant outages at the Entergy Pilgrim Nuclear Power Plant (PNPS) contributed a larger amount of waste to the total LLRW figures in 2011 and 2013. These scheduled refueling outages occur every 24 months with some resulting in higher generation volumes. In addition, unplanned shut-down outages, such as those that occurred in 2013, further contribute to the generation increases.

On July 1, 2008, the LLRW facility in Barnwell, SC – the last in the United States that accepted out-of-compact Class B and C waste – closed. Massachusetts is not in a multistate compact. After mid-2008, the generation of Class B and C waste declined. Notably, Class C activity generation declined by more than 100 fold, and volumes by ten-fold. This decrease was likely due to the utilities and commercial facilities altering work and waste processing practices to avoid generation of Class B & C wastes and to avoid storing Class C wastes on site.

Class A radioactivity generation (Ci) from utilities and commercial facilities has tripled due to the increased scope of maintenance and repair activities. Class A volumes (ft3) have remained stable, except from academic facilities, which are generating lower volumes due to their decreasing use of radioactive material in research and development.

Low Level Radioactive Waste
Trend Report: Calendar Years 2010-2014

1. INTRODUCTION

Low-level radioactive waste (LLRW) is radioactive material that (1) is neither high-level radioactive waste, nor spent fuel, nor uranium mill tailings; and, (2) is classified by the U.S. Nuclear Regulatory Commission (NRC) as LLRW. This does not include waste owned or generated by the U.S. Department of Energy, the U.S. Navy (e.g., decommissioning Navy vessels), or by the federal government as a result of any research, development, testing, or production of any atomic weapon, all of which remain a federal responsibility.

LLRW typically consists of radioactively contaminated trash such as paper, rags, plastic, glassware, syringes, protective clothing (e.g. gloves, coveralls), cardboard, packaging material, organic material, spent pharmaceuticals, used (e.g. decayed) sealed radioactive sources, and water-treatment residues. The radioactivity of LLRW can range from just above background levels found in nature to highly radioactive in certain cases. The maximum concentration for each class of LLRW can be found in 105 CMR 120.299 for Class A, B, and C wastes, and 345 CMR 1.13(B) for high volume low activity (HVLA) waste.

Typical applications of LLRW include:

- The production of contaminated ion-exchange resins and filters, tools, clothing, and irradiated metals and other hardware by a nuclear power plant;
- The production and end-use of radiopharmaceuticals for medical procedures such as cancer and thyroid dysfunction diagnosis and treatment, radioimmunoassay and diagnostic imaging examinations;
- Research and development in the life science and biotechnology industry for the treatment and prevention of various diseases and medical conditions, and in the environmental field to study the effects of chemicals on plant and aquatic life, and for ocean studies;
- Commercial uses such as within instruments that measure level, thickness, and density or that are used in moisture analysis and quality control; sealed sources that are used for industrial radiography of pressure vessels and other structural welds; smoke detectors and exit signs in buildings and commercial aircraft; and,
- University education and research in medicine, material science and biotechnology.

1.1. Overview and Objectives

Annually each specific licensee that produces LLRW is surveyed to summarize the amount (e.g. volume and activity) of LLRW generated (e.g. transferred and in-storage) by waste classification, and the radioisotopes generated in each waste class. The LLRW data are evaluated by RCP to identify trends; significant generation and generators; and determine storage, treatment, and disposal solutions. This information supports the formulation of LLRW policy in the Commonwealth.

A database for tracking LLRW was developed by the Massachusetts Department of Public Health, Bureau of Environmental Health, Radiation Control Program (RCP) in 2002. This database contains records of LLRW reported to the RCP by their licensees, as well as from Nuclear Regulatory Commission (NRC) licensees located in Massachusetts. The database is maintained by the RCP and contains almost 6,000 surveys submitted from approximately 2000 to the present.

In Massachusetts, there are four waste classifications from which the Licensees report: Class A, Class B, Class C, and High Volume Low Activity (HVLA) (see Appendix C for further discussion of these waste classes). To better analyze the data in terms of usage and generation trends, each Specific Licensee is further classified into five waste generator categories and six facility types:

Waste Generator Categories
Academic
Commercial
Government
Health
Utility

Facility Types
Federal Agency
State Agency
State Education
Municipality
Private, Profit
Private, Non-Profit

1.2. LLRW Data

The data presented in this report summarizes LLRW generated in the calendar years 2010-2014. There was no attempt to remove LLRW waste data that was either not required to be reported or was mixed with waste that was required to be reported. This report provides a review of the annual trend data for each waste classification, waste generator category, and facility type.

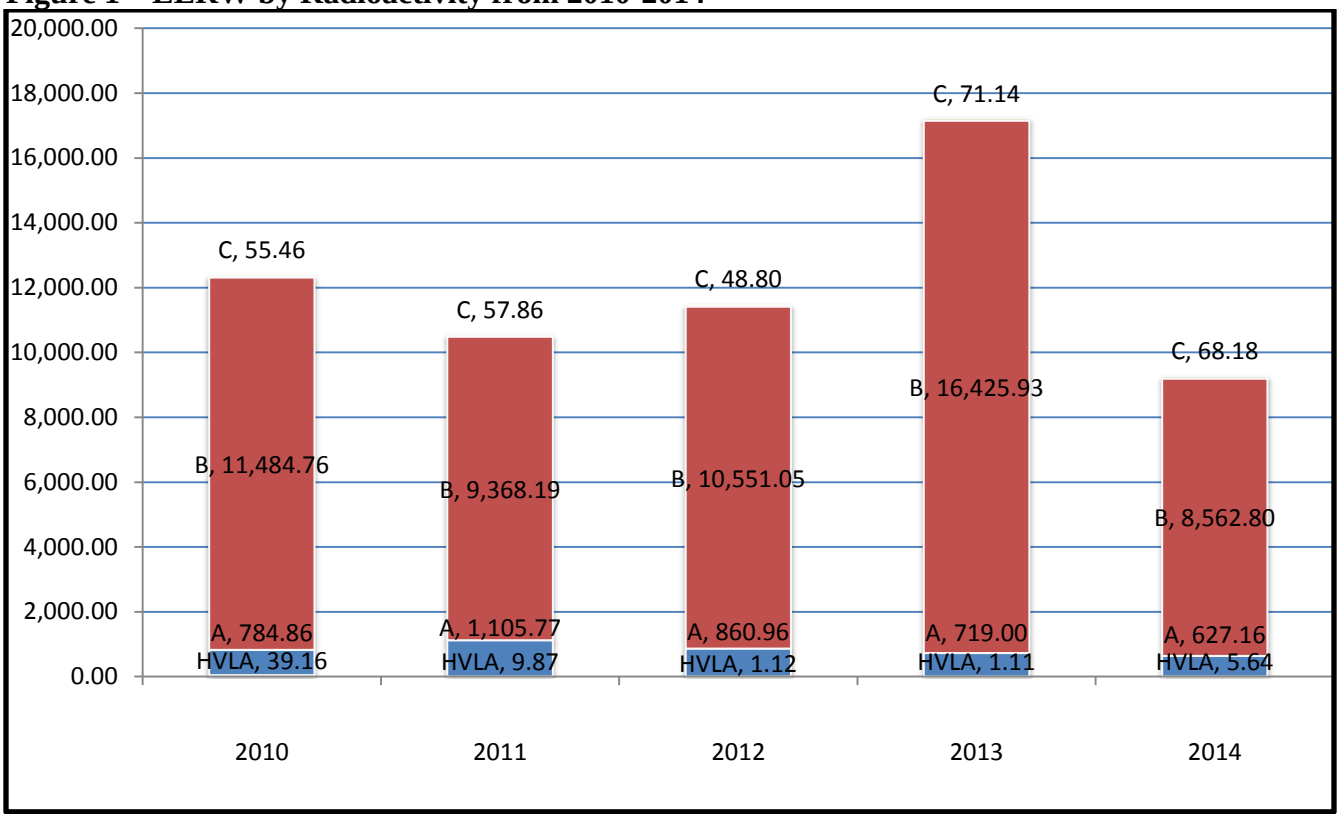
Trends in this report consider only volumes, activities, and waste class reported; the report does not directly account for external issues such as changes to regulatory requirements or changes in the number of licensees.

2. ANALYSIS of LLRW SURVEY DATA

2.1 LLRW by Radioactivity (Ci)

2.1.1 All LLRW by Radioactivity

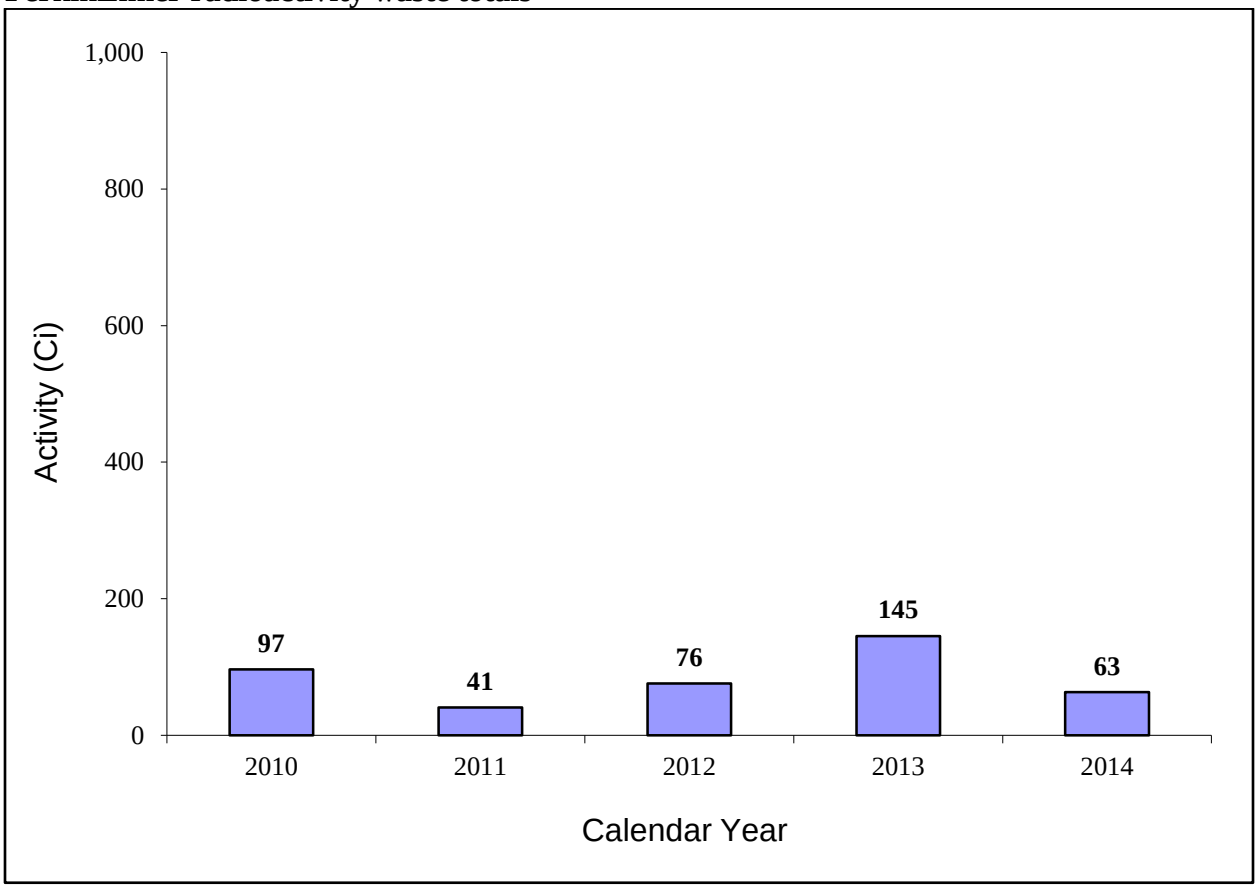
Figure 1 – LLRW by Radioactivity from 2010-2014



The following observations are made regarding the data in Figure 1.

- Entergy PNPS and PerkinElmer, Inc. were the top Class A radioactivity generators from 2010-2014.
- Entergy PNPS (resins), PerkinElmer, Inc. (radiopharmaceutical manufacturer), and QSA Global, Inc. (industrial radioactive source manufacturer) generated large quantities of Class B radioactivity from 2010-2014.
- Entergy PNPS (resin and irradiated metals) and PerkinElmer, Inc. generated the most Class C radioactivity from 2010-2014.
- PerkinElmer, Inc. and U.S. Army Corps of Engineers (Shpack landfill cleanup) generated the most Class HVLA radioactivity from 2010-2013. In 2014, Morpho Detection, LLC produced 81% of HVLA radioactivity.

Figure 2 - Annual Radioactivity of LLRW Generated Excluding Entergy, QSA Global, and PerkinElmer radioactivity waste totals



- Comparing Figure 1 to Figure 2 shows that Entergy PNPS, PerkinElmer, Inc. & QSA Global, Inc. account for at least 98% of the LLRW generated every year.

- Beverly Microwave Division, Herley Industries, Inc., Industrial Nuclear Co., Petnet Solutions, Inc. and Thermo Scientific generated the most Class A radioactivity from 2010-2014.

- Top Class B radioactivity generators for years 2010-2014:
  Mevion Medical Systems;
  Morpho Detection, LLC; and,
  UMass Lowell

- Top Class HVLA radioactivity generators for years 2010-2014:
  Accuratus Lab Services, Inc.;
  Areva, NP, Inc.;
  Boston Heart Diagnostics;
  Charm Sciences, Inc.;
  Morpho Detection, LLC; and,
  Philotechnics, Ltd.

2.1.2. LLRW Radioactivity by Waste Generator Category

Table 1. Calendar Year by Radioactivity (Ci)

	2010	2011	2012	2013	2014
Academic	0.73	0.45	14.86	0.63	0.95
Commercial	11,030.24	10,185.76	10,617.06	17,082.94	8,533
Government	34.62	9.84		0.00	
Health	0.94	1.64	0.30	3.01	0.33
Utility	1,297.70	344.00	829.70	130.60	729

- Due to their manufacturing and nuclear power production activities, commercial and to a lesser extent utility facilities dominate the amount of radioactivity generated in any given year in the B Waste Generator category.

- Fluctuations in radioactivity generated are much greater from commercial & utility entities due to outages and planned and unplanned decommissioning projects. In 2010 Entergy PNPS generated a larger than anticipated volume of Class C wastes due to maintenance activities in the refuel and spent fuel pool.

2.1.3. LLRW Radioactivity by Waste Class

Table 2. Radioactivity by LLRW Waste Class (Ci)

	2010	2011	2012	2013	2014
A	784.85	1,105	860.95	718	627
B	11,484	9,368	10,551	16,425	8,563
C	55.46	57.86	48.80	71.14	68
HVLA	39.15	9.87	1.11	1.10	5.64

- PerkinElmer, Inc. generated the most Class A radioactivity from 2010-2014.

- PerkinElmer, Inc., QSA Global, and Entergy PNPS reported a combined total of 56,372 Ci of Class B waste from 2010-2014.

- Entergy PNPS generated the largest share of Class C waste – 47.7 Ci for years 2010-2014.

- From 2010-2014, HVLA radioactivity decreased due to the conclusion of the Shpack landfill clean up by the U.S. Army Corps of Engineers.

2.1.4. Top Radioactivity Generators in CY 2010-2014

Table 3. Top Activity Generators in 2010

Facility Name	Total Activity (Ci)
QSA GLOBAL, INC.	9,983
ENTERGY PNPS	1,297
PERKINELMER, INC.	986

Table 4. Top Activity Generators in 2011

Facility Name	Total Activity (Ci)
PERKINELMER, INC.	9,830
ENTERGY PNPS	344
QSA GLOBAL, INC.	326

Table 5. Top Activity Generators in 2012

Facility Name	Total Activity (Ci)
QSA GLOBAL, INC.	9,552
PERKINELMER, INC.	1,003
ENTERGY PNPS	829

Table 6. Top Activity Generators in 2013

Facility Name	Total Activity (Ci)
QSA GLOBAL, INC.	10,622
PERKINELMER, INC.	6,318
ENTERGY PNPS	130

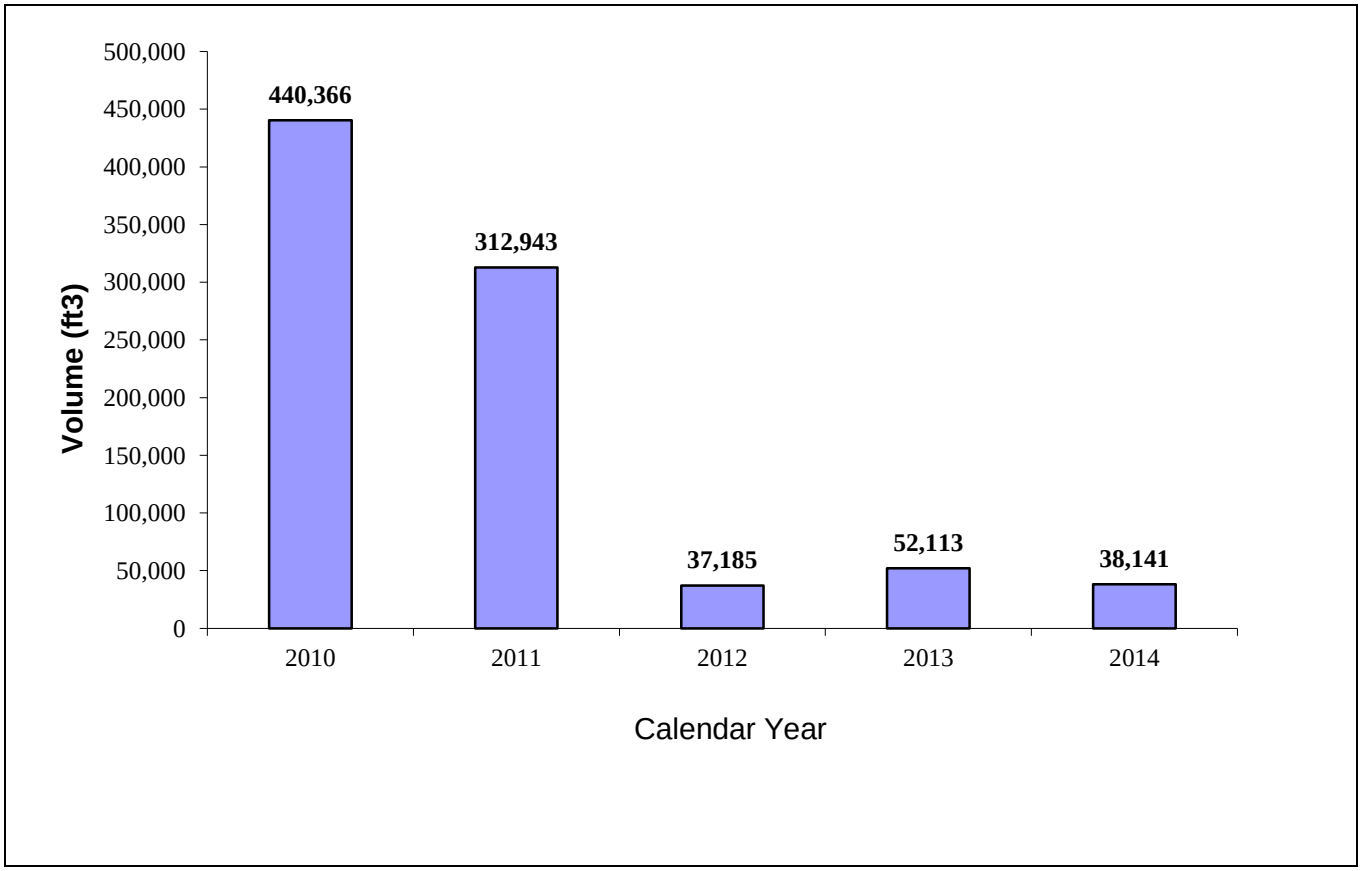
Table 7. Top Activity Generators in 2014

Facility Name	Total Activity (Ci)
PERKINELMER, INC.	8,470
ENTERGY PNPS	729
PETNET SOLUTIONS, INC.	19

2.2. LLRW by Volume

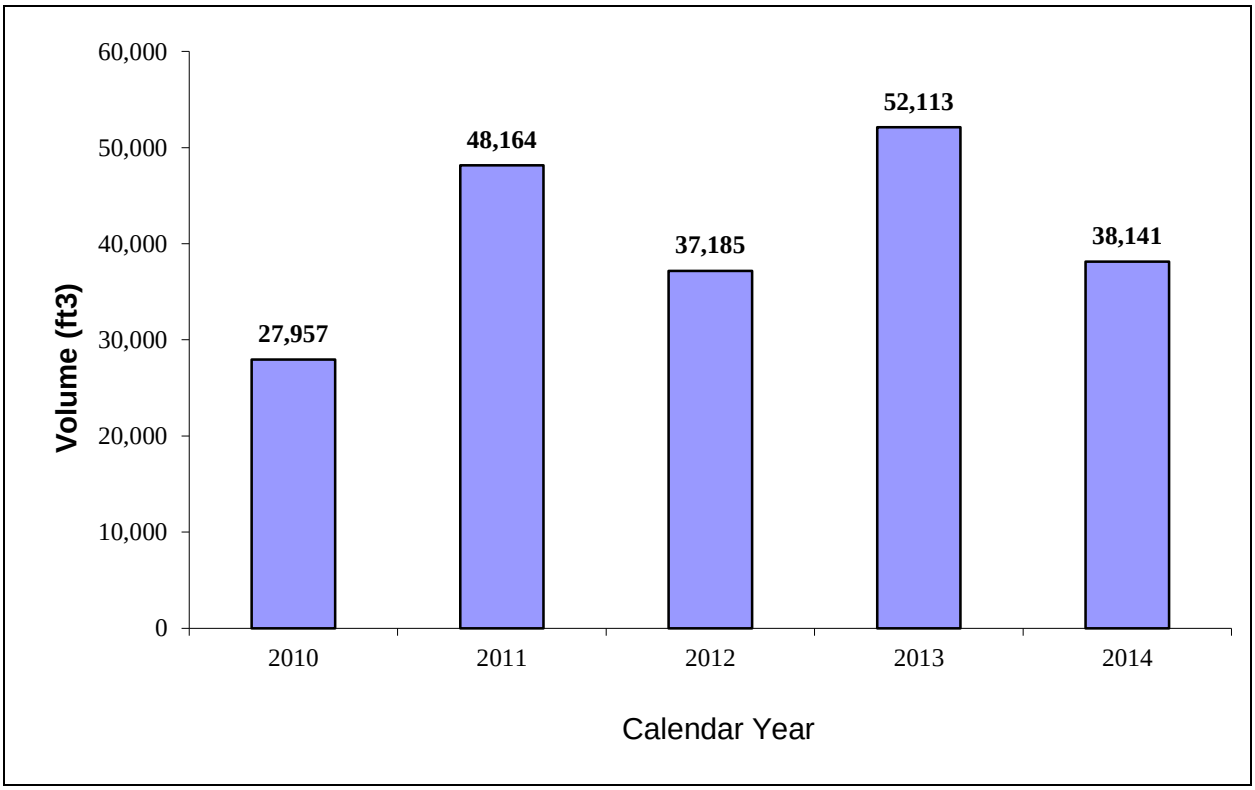
2.2.1. All LLRW by Volume (ft3)

Figure 3 – LLRW by Volume from 2010-2014



- Waste volumes are largely influenced by one-time-only decommissioning projects. The Shpack landfill National Priority List Superfund site cleanup headed by the U.S. Army Corps of Engineers accounted for 94% in 2010.
- Consistent large volume generators include Entergy PNPS, PerkinElmer, Inc., and Unitech Services Group.
- Entergy PNPS generated 53% of the total volume in 2012 due to site maintenance activities.
- In 2013, Entergy PNPS generated 79% of the total volume due to scheduled refueling outage.
- In 2014, Entergy PNPS produced 60%, or 22,775 cubic feet of Class A waste.

Figure 4 - Annual Volume of LLRW Generated from 2010-2014, Excluding Shpack Landfill Cleanup



- Facilities that generated the most volume from 2010-2014:
    - Bartlett Nuclear, Inc.;
    - Entergy PNPS;
    - Harvard University;
    - Lantheus Medical Imaging;
    - Morpho Detection, LLC;
    - PerkinElmer, Inc.;
    - Philotechnics, Ltd; and,
    - Unitech Services Group, Inc.

2.2.2. LLRW Volume by Waste Generator Category

Table 8. Volume (ft^3) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	545	468	830	1,055	1,814
Commercial	11,749	14,121	14,573	9,459	12,328
Government	412,409	264,783		4	29
Health	964	671	2,187	562	1,051
Utility	14,699	32,899	19,595	41,030	22,917

- Waste volumes are largely influenced by one-time-only decommissioning projects.
- In 2010, the U.S. Army Corps of Engineers generated 412,409 cubic feet of HVLA waste (Shpack landfill clean-up). In 2011, the U.S. Army Corps of Engineers produced 264,779 cubic feet of HVLA, or approximately 100% of the total volume generated.
- Entergy PNPS (Utility) generated the most volume from 2010-2014.

2.2.3. LLRW Volume by Facility Type

Table 9. Volume (ft^3) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	412,432	264,848	51	9.06	320
Private, Non-Profit	1,292	965	2,815	1,338	2,485
Private, Profit	26,448	47,020	34,159	50,489	35,245
State Education Facility	194	110	160	274	62

- Waste volumes are largely influenced by one-time-only decommissioning projects.
- In 2010 and 2011, the U.S. Army Corps of Engineers (Federal Agency) generated a significant amount of waste volume due to the Shpack landfill clean-up.
- Private, profit volume generation among the top facilities:
  - Bartlett Nuclear;
  - Dana-Farber Cancer Institute;
  - Harvard University;

- Lantheus Medical Imaging, Inc.;
- Morpho Detection, LLC;
- PerkinElmer, Inc.;
- Philotechnics, Ltd.; and,
- Unitech Services Group, Inc.

2.2.4. LLRW Volume by Waste Class

Table 10. Volume (ft^3) by Waste Class

Class	2010	2011	2012	2013	2014
A	27,326	47,397	31,040	51,717	33,028
B	387	419	586	250	467
C	30	53	37	98	86
HVLA	412,623	265,074	5,522	48	4,559

- HVLA waste volumes are largely influenced by one-time-only decommissioning projects (e.g., U.S. Army Corps of Engineers - Shpack landfill cleanup).

- Entergy PNPS, Harvard University, Lantheus Medical Imaging, Inc., PerkinElmer, Inc., and Unitech Services Group were the largest generators of Class A volume from 2010-2014.

- Top HVLA waste volume generators in 2012 and 2014:

  1. Bartlett Nuclear;
  2. Boston Heart Diagnostics;
  3. Dana-Farber Cancer Institute; and,
  4. Philotechnics, Ltd.

- In 2014, Morpho Detection, LLC reported 1,509 ft3 of HVLA. Out of 1,509 ft3, 877 ft3 of HVLA was transferred off site. The remaining 632 ft3 of HVLA was stored on the facility's premises.

2.2.5. Top Generators by Volume from CY 2010-2014

Table 11. Top Generators by Volume (ft^3) in Calendar Year 2010

Facility Name	Waste Volume (ft^3)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	412,409
ENTERGY PNPS	14,699
UNITECH SERVICES GROUP, INC.	2,600

Table 12. Top Generators by Volume (ft^3) in Calendar Year 2011

Facility Name	Waste Volume (ft^3)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	264,779
ENTERGY PNPS	32,899
UNITECH SERVICES GROUP, INC.	4,600

Table 13. Top Generators by Volume (ft^3) in Calendar Year 2012

Facility Name	Waste Volume (ft^3)
ENTERGY PNPS	19,595
PHILOTECHNICS, LTD	4,085
UNITECH SERVICES GROUP, INC.	2,370

Table 14. Top Generators by Volume (ft^3) in Calendar Year 2013

Facility Name	Waste Volume (ft3)
ENTERGY PNPS	41,030
UNITECH SERVICES GROUP, INC.	2,550
PERKINELMER, INC.	1,803

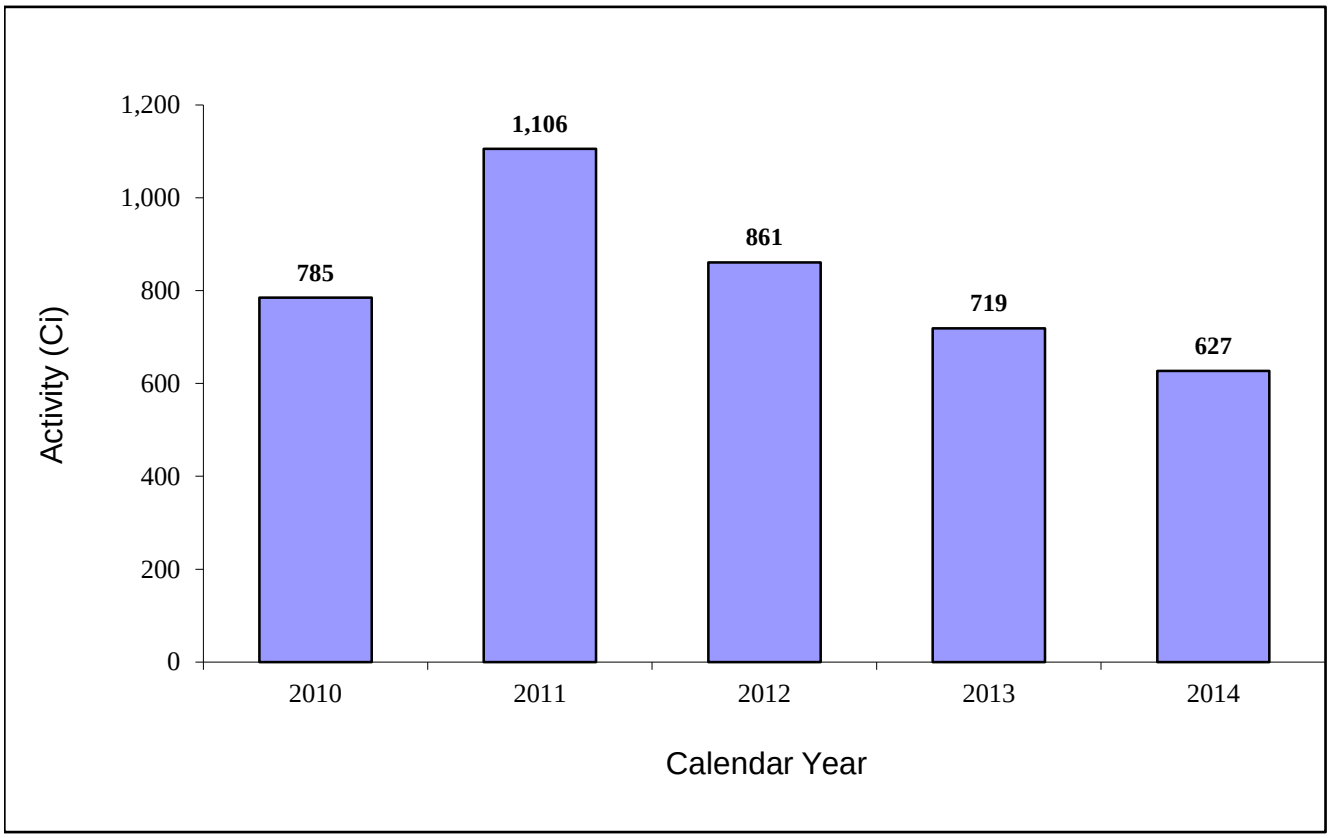
Table 15. Top Generators by Volume (ft^3) in Calendar Year 2014

Facility Name	Waste Volume (ft3)
ENTERGY PNPS	22,917
BARTLETT NUCLEAR, INC.	2,560
PERKINELMER, INC.	1,895

2.3. Class A LLRW by Radioactivity

2.3.1. All Class A Radioactivity (Ci)

Figure 5 - Class A Radioactivity



- In 2008, the last LLRW disposal facility in the U.S. still accepting out-of-compact Class B and C wastes closed (Barnwell, SC). Since then, generation of Class B and C waste has declined, likely due to the utilities and commercial facilities storing on site or altering work and waste processing practices to avoid generation of Class B & C wastes.

- Class A radioactivity generation had trended upwards until 2011. Upward trend likely due to generators altering use handling processes to make less Class B & C radioactivity, resulting in more generation of Class A radioactivity.

- Reduction in Class A radioactivity from 2012-2014. Top facilities that generated Class A radioactivity from 2010-2014:

  1. Entergy PNPS;
  2. PerkinElmer, Inc.; and,
  3. QSA Global, Inc.

2.3.2. Class A Radioactivity by Waste Generator Category

Table 16. Class A Radioactivity (Ci) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	0.73	0.44	0.86	0.62	0.95
Commercial	603	860	702	632.46	529
Health	0.94	1.63	0.29	3	0.33
Utility	180	243	157	82.90	96

The following observations are made regarding the data in Table 16.

- Commercial facilities generated the most Class A radioactivity from 2010-2014. For example, PerkinElmer was the top generator of Class A radioactivity for five consecutive years.

- Entergy PNPS (Utility) generated the most Class A radioactivity for each year.

2.3.3. Class A Radioactivity by Facility Type

Table 17. Class A Radioactivity (Ci) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	0.55	1.30	0.00	0.00	0.000000045
Private, Non-Profit	1.07	0.72	1.13	3.51	1.24
Private, Profit	783	1,103	859	715	625
State Education Facility	0.05	0.05	0.01	0.112	0.03

The following observations are made regarding the data in Table 17.

- Private, for-profit facilities dominate Class A radioactivity generation.

2.3.4. Top Class A Radioactivity Generators from CY 2010-2014

Table 18. Top Class A Radioactivity (Ci) in Calendar Year 2010

Facility Name	Class A (Ci)
PERKINELMER, INC.	534
ENTERGY PNPS	180
PETNET SOLUTIONS, INC.	19

Table 19. Top Class A Radioactivity (Ci) in Calendar Year 2011

Facility Name	Class A (Ci)
PERKINELMER, INC.	829
ENTERGY PNPS	243
BEVERLY MICROWAVE DIVISION OF COMMUNICATIONS AND POWER	10

Table 20. Top Class A Radioactivity (Ci) in Calendar Year 2012

Facility Name	Class A (Ci)
PERKINELMER, INC.	635
ENTERGY PNPS	157
PETNET SOLUTIONS, INC.	20

Table 21. Top Class A Radioactivity (Ci) in Calendar Year 2013

Facility Name	Class A (Ci)
PERKINELMER, INC.	490
ENTERGY PNPS	82
INDUSTRIAL NUCLEAR COMPANY, INC.	80

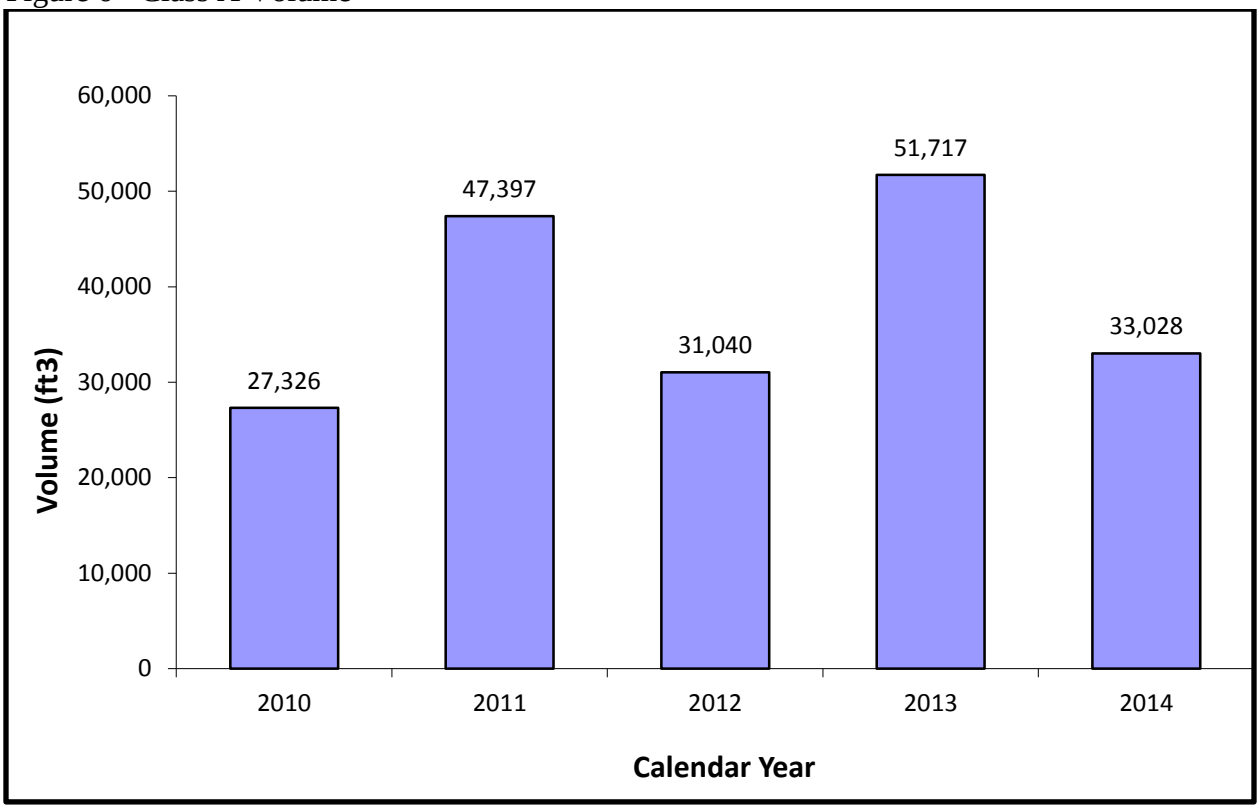
Table 22. Top Class A Radioactivity (Ci) in Calendar Year 2014

Facility Name	Class A (Ci)
PERKINELMER, INC.	491
ENTERGY PNPS	96
PETNET SOLUTIONS, INC.	19

2.4. Class A LLRW by Volume

2.4.1. All Class A Volume

Figure 6 - Class A Volume



- Class A volume variability is largely due to planned and unplanned utility outages and other decommissioning projects.

- Entergy Nuclear generated 68% of total Class A volume from 2010-2014.

- Top Class A volume generators from 2010-2014:

  1. Charles River Laboratories, Inc.;
  2. Entergy PNPS;
  3. Harvard University;
  4. Lantheus Medical Imaging, Inc.;
  5. PerkinElmer, Inc.; and,
  6. Unitech Services Group, Inc.

- Scheduled plant outages at the Entergy Pilgrim Nuclear Power Plant (PNPS) contributed a larger amount of waste to the total LLRW figures in 2011 and 2013. These scheduled refueling outages occur every 24 months with some resulting in higher generation volumes. In addition, unplanned shut-down outages, such as those that occurred in 2013, further contribute to the generation increases.

2.4.2. Class A Volume by Waste Generator Category

Table 23. Class A Volume (ft^3) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	544	467	815	1,055	1,815
Commercial	11,417	13,554	9,897	9,083	7,357
Government		4		4	
Health	964	670	826	556	1,052
Utility	14,400	32,700	19,500	41,015	22,775

- The annual variability in Class A volume from Utility's is due to outages – e.g., Entergy PNPS. Scheduled plant outages at the Entergy Pilgrim Nuclear Power Plant (PNPS) contributed a larger amount of waste to the total LLRW figures in 2011 and 2013. These scheduled refueling outages occur every 24 months with some resulting in higher generation volumes.

- Commercial facilities generated a significant amount of Class A waste from 2010-2014:

  Charles River Laboratories, Inc.;
  Lantheus Medical Imaging, Inc.;
  PerkinElmer, Inc.; and,
  Unitech Services Group, Inc.

- Waste volume generation in the Health category varies from year to year. The top facilities that produced Class A waste volume:

  1. Beth Israel Deaconess Medical Center;
  2. Brigham & Women's Hospital;
  3. Dana-Farber Cancer Institute;
  4. Joslin Diabetes Center;
  5. Massachusetts General Hospital;
  6. Tufts Medical Center; and,
  7. UMass Memorial Healthcare.

2.4.3. Class A Volume by Facility Type

Table 24. Class A Volume (ft^3) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	23.60	69	51	4	320
Private, Non-Profit	1,291	964	1,455	1,337	2,485
Private, Profit	25,817	46,253	29,388	50,098	30,132
State Education Facility	193	109	145	274	62

- Private, Profit facilities dominated the generation of Class A volumes.

- Private, Profit varies from year to year due to Utility outages and planned and unplanned decommissioning work.

- Private, Non-Profit licensees produced the most Class A volume in any given year (e.g., hospitals and universities).

2.4.4. Top Class A Volume Generators from CY 2010-2014

Table 25. Top Class A Volume Generators in Calendar Year 2010

Facility Name	Class A (ft^3)
ENTERGY PNPS	14,400
UNITECH SERVICES GROUP, INC.	2,600
PERKINELMER, INC.	2,467

Table 26. Top Class A Volume Generators in Calendar Year 2011

Facility Name	Class A (ft^3)
ENTERGY PNPS	32,700
UNITECH SERVICES GROUP, INC.	4,600
PERKINELMER, INC.	2,329

Table 27. Top Class A Volume Generators in Calendar Year 2012

Facility Name	Class A (ft^3)
ENTERGY PNPS	19,500
UNITECH SERVICES GROUP, INC.	2,370
PERKINELMER, INC.	1,780

Table 28. Top Class A Volume Generators in Calendar Year 2013

Facility Name	Class A (ft^3)
ENTERGY PNPS	41,015
UNITECH SERVICES GROUP, INC.	2,550
PERKINELMER, INC.	1,465

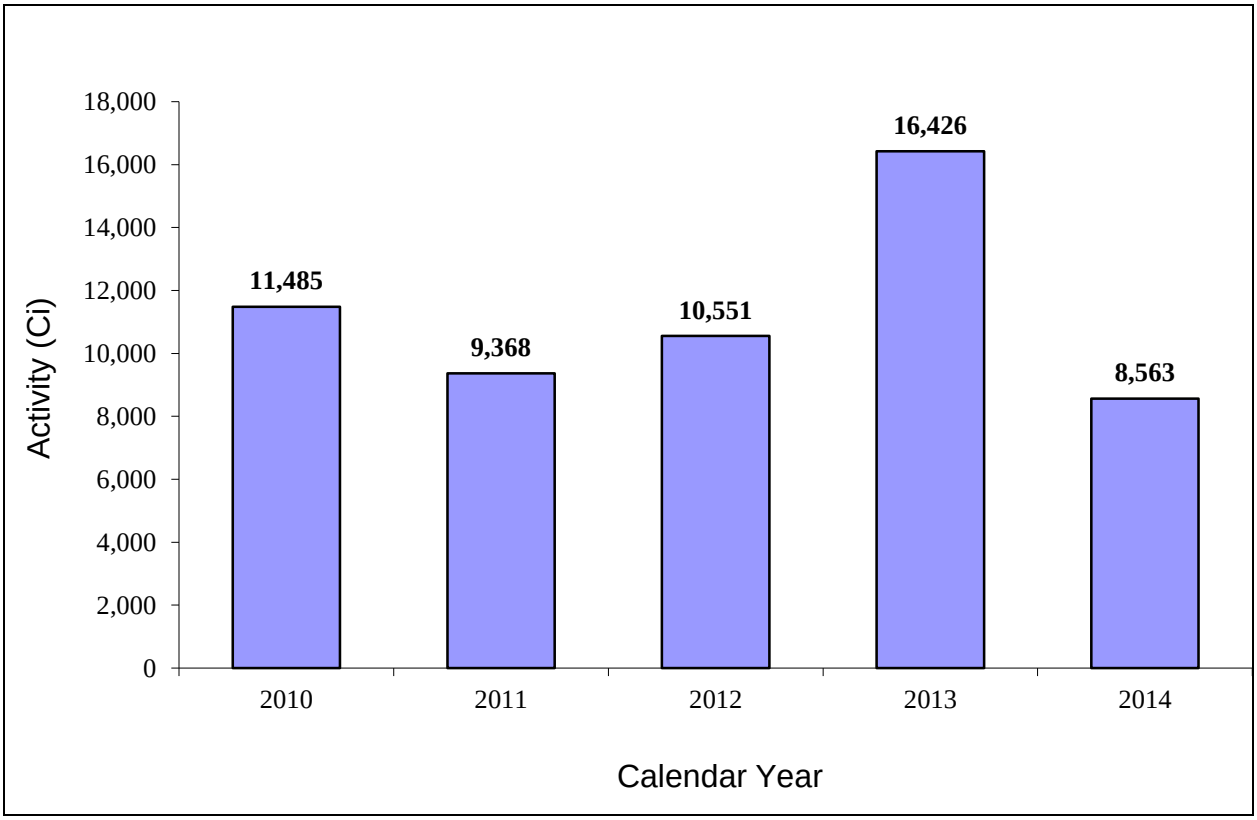
Table 29. Top Class A Volume Generators in Calendar Year 2014

Facility Name	Class A (ft^3)
ENTERGY PNPS	22,775
PERKINELMER, INC.	1,527
HARVARD UNIVERSITY	1,326

2.5. Class B LLRW by Radioactivity

2.5.1. All Class B by Radioactivity

Figure 7 - All Class B by Radioactivity



- Class B radioactivity generation appears to have an upward trend (years 2011-2013) likely due to:

    1. Commercial facilities ramping up source production
    2. Radioactive waste system resins capturing more activity during refueling and spent fuel pool maintenance activities.

- QSA Global, Inc., PerkinElmer, Inc., and Entergy PNPS reported the most Class B radioactivity from 2010-2014.

2.5.2. Class B Radioactivity by Waste Generator Category

Table 30. Class B Radioactivity (Ci) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	2.00e-05		14		
Commercial	10,414	9,314	9,912	16,425	7,977
Utility	1,070	53.2	625		585

- Commercial facilities dominate the generation of Class B radioactivity.

2.5.3. Class B Radioactivity by Facility Type

Table 31. Class B Radioactivity (Ci) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	35.17	11.14	0.00	0.00	
Private, Non-Profit	1.07	0.73	1.14	3.52	
Private, Profit	12,327.94	10,529.76	11,446.76	17,213.54	8,562
State Education Facility	0.05	0.06	14.02	0.11	

- Private, For Profit facilities dominate the generation of Class B radioactivity.

2.5.4. Top Class B Radioactivity Generators from CY 2010-2014

Table 32. Top Class B Radioactivity Generators in Calendar Year 2010

Facility Name	Class B (Ci)
QSA GLOBAL, INC.	9,974
ENTERGY PNPS	1,070
PERKINELMER, INC.	440

Table 33. Top Class B Radioactivity Generators in Calendar Year 2011

Facility Name	Class B (Ci)
PERKINELMER, INC.	8,991
QSA GLOBAL, INC.	323
ENTERGY PNPS	53

Table 34. Top Class B Radioactivity Generators in Calendar Year 2012

Facility Name	Class B (Ci)
QSA GLOBAL, INC.	9,546
ENTERGY PNPS	625
PERKINELMER, INC.	365

Table 35. Top Class B Radioactivity Generators in Calendar Year 2013

Facility Name	Class B (Ci)
QSA GLOBAL, INC.	10,619
PERKINELMER, INC.	5,803
MORPHO DETECTION, LLC.	2.23

Table 36. Top Class B Radioactivity Generators in Calendar Year 2014

Facility Name	Class B (Ci)
PERKINELMER, INC.	7,976
ENTERGY PNPS	585
MORPHO DETECTION, LLC.	1.08

2.6. Class B LLRW by Volume

2.6.1. All Class B by Volume

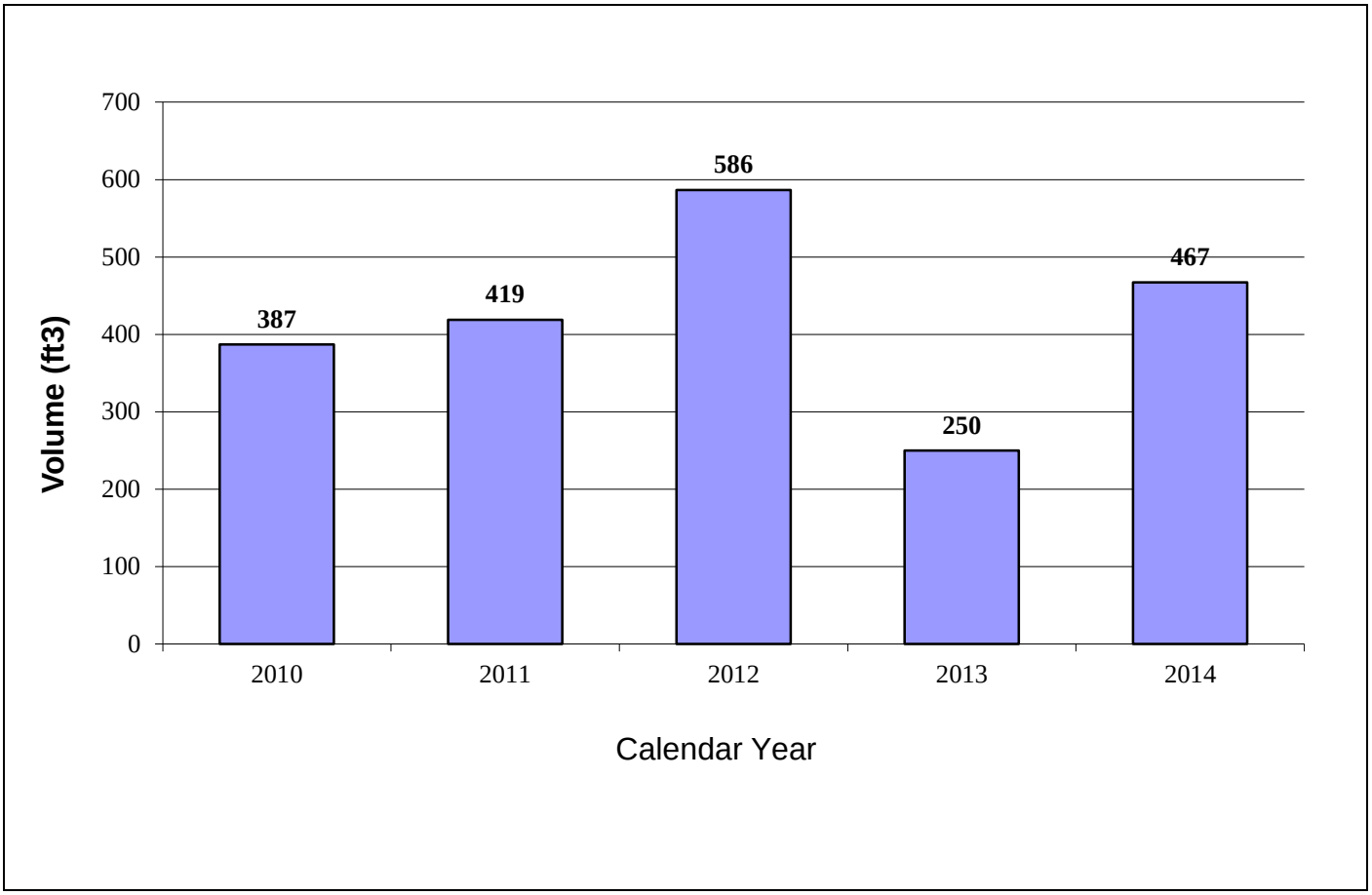


Figure 8 - All Class B by Volume

- Entergy PNPS, Mevion Medical Systems, Inc., Morpho Detection, LLC, and PerkinElmer, Inc. generated the most Class B volume from 2010-2014.

- In 2014, PerkinElmer, Inc. generated 322 ft3 out of 467 ft3 of Class B.

2.6.2. Class B Volume by Waste Generator Category

Table 37. Class B Volume (ft^3) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	1.40e-04		7.30		
Commercial	102	234	499	249.75	332
Utility	284	184	80		135

- Utility facility's Class B volume varies due to outages at Entergy PNPS.
- Commercial facilities that generated the most Class B volume from 2010-2014: Mevion Medical Systems, Inc., Morpho Detection, LLC, and PerkinElmer, Inc.

2.6.3. Class B Volume by Facility Type

Table 38. Class B Volume (ft^3) by Facility Type

	2010	2011	2012	2013	2014
Private, Non-Profit	1.40e-04				
Private, Profit	386	418	579	249.75	467
State Education Facility	0		7.30		

- Private, Profit facilities (e.g., Entergy PNPS, Morpho Detection, LLC, and PerkinElmer) dominate the volume of Class B generated from 2010-2014.

2.6.4. Top Class B Volume Generators in CY 2010-2014

Table 39. Top Class B Volume Generators in Calendar Year 2010

Facility Name	Class B (ft^3)
ENTERGY PNPS	284
PERKINELMER, INC.	51.79
MEVION MEDICAL SYSTEMS, INC.	50

Table 40. Top Class B Volume Generators in Calendar Year 2011

Facility Name	Class B (ft^3)
PERKINELMER, INC.	184.5
ENTERGY PNPS	184
MEVION MEDICAL SYSTEMS, INC.	50

Table 41. Top Class B Volume Generators in Calendar Year 2012

Facility Name	Class B (ft^3)
PERKINELMER, INC.	498
ENTERGY PNPS	80
MASS. -LOWELL, UNIVERSITY OF	7.30

Table 42. Top Class B Volume Generators in Calendar Year 2013

Facility Name	Class B (ft^3)
PERKINELMER, INC.	247.5
MORPHO DETECTION, LLC.	1.36
QSA GLOBAL, INC.	0.88

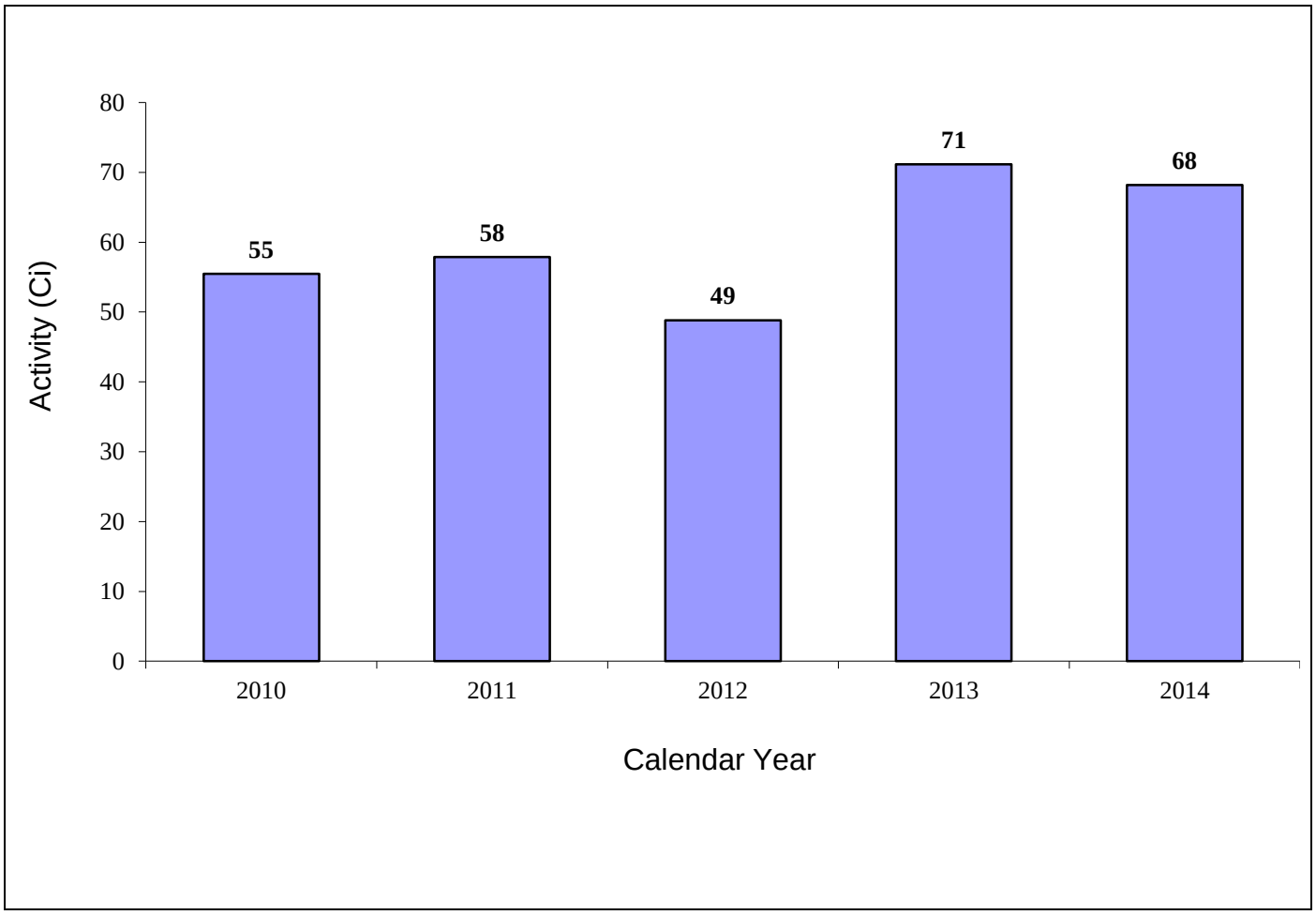
Table 43. Top Class B Volume Generators in Calendar Year 2014

Facility Name	Class B (ft^3)
PERKINELMER, INC.	322
ENTERGY PNPS	135
MORPHO DETECTION, LLC.	5.45

2.7. Class C LLRW by Radioactivity

2.7.1. All Class C Radioactivity

Figure 9 - All Class C Radioactivity



- Utility and commercial entities generated the majority of Class C radioactivity.

2.7.2. Class C Radioactivity by Waste Generator Category

Table 44. Class C Radioactivity (Ci) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	0		3.00e-03		
Commercial	7.76	10.15	1.10	23.4	20.48
Utility	47.7	47.7	47.7	47.7	47.7

- Utility and commercial facilities (e.g., PerkinElmer, Inc. & Entergy PNPS) dominate the radioactivity generation of Class C every year.

2.7.3. Class C Radioactivity by Facility Type

Table 45. Class C Radioactivity (Ci) by Facility Type

	2010	2011	2012	2013	2014
Private, Profit	55.46	57.86	48.8	71.14	68.18
State Education Facility	0		3.00e-03		

- Private, Profit facilities (e.g., PerkinElmer, Inc. & Entergy PNPS) dominate the radioactivity generation of Class C every year.

2.7.4. Top Class C Radioactivity Generators from CY 2010-2014

Table 46. Top Class C Radioactivity Generators in 2010

Facility Name	Class C (Ci)
ENTERGY PNPS	47.70
PERKINELMER, INC.	7.76

Table 47. Top Class C Radioactivity Generators in 2011

Facility Name	Class C (Ci)
ENTERGY PNPS	47.70
PERKINELMER, INC.	10.15

Table 48. Top Class C Radioactivity Generators in 2012

Facility Name	Class C (Ci)
ENTERGY PNPS	47.70
PERKINELMER, INC.	1.10

Table 49. Top Class C Radioactivity Generators in 2013

Facility Name	Class C (Ci)
ENTERGY PNPS	47.70
PERKINELMER, INC.	23.44

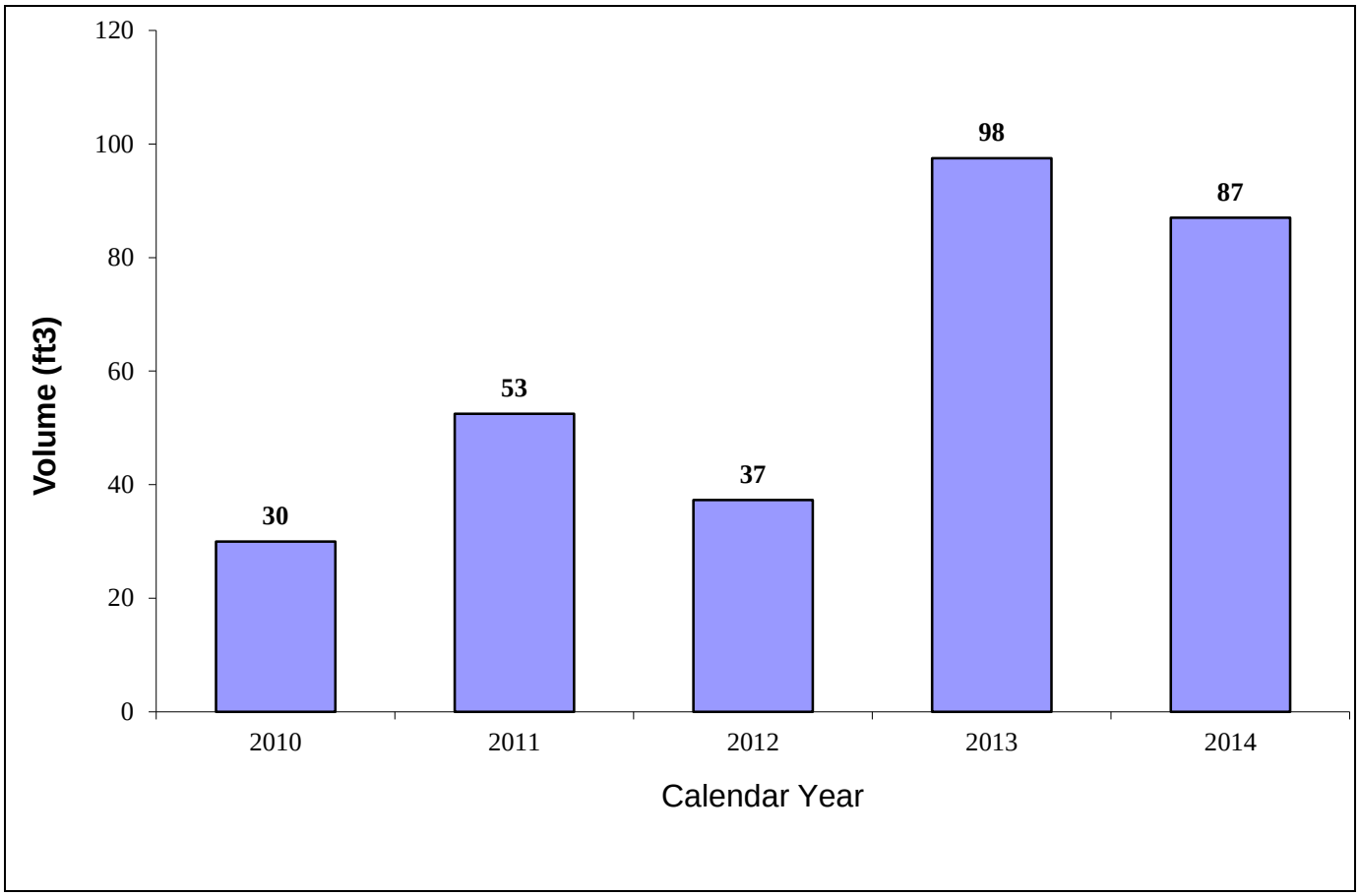
Table 50. Top Class C Radioactivity Generators in 2014

Facility Name	Class C (Ci)
ENTERGY PNPS	47.70
BEVERLY MICROWAVE DIVISION	13.1

2.8. Class C LLRW by Volume

2.8.1. All Class C by Volume

Figure 10 - All Class C by Volume



The following observations are made regarding the data in Figure 10.

- The large variability in Class C volumes is due to utility outages, which results in more radionuclide production. Scheduled outages at Entergy PNPS can contribute significantly to total LLRW figures; outages occur approximately every 24 months and some are much more comprehensive than others (e.g. produce more waste).

2.8.2. Class C Volume by Waste Generator Category

Table 51. Class C Volume (ft^3) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	0		7.30		
Commercial	15	37.5	15	82.5	80.36
Utility	15	15	15	15	6.65

- Utility and commercial facilities (e.g., PerkinElmer, Inc. & Entergy PNPS) dominate the volume generation of Class C every year.

- University of Massachusetts Lowell generated 7.30 ft3 of Class C in 2012 due to reactor cleanout activities.

2.8.3. Class C Volume by Facility Type

Table 52. Class C Volume (ft^3) by Facility Type

	2010	2011	2012	2013	2014
Private, Profit	30	52.5	30	97.5	87
State Education Facility	0		7.30		

- Private, Profit facilities (e.g., PerkinElmer, Inc. & Entergy PNPS) dominate the volume generation of Class C every year.

- University of Massachusetts Lowell generated 7.30 ft3 of Class C in 2012.

2.8.4. Top Class C Volume Generators from CY 2010-2014

Table 53. Top Class C Volume Generators in Calendar Year 2010

Facility Name	Class C (ft^3)
ENTERGY PNPS	15
PERKINELMER, INC.	15

Table 54. Top Class C Volume Generators in Calendar Year 2011

Facility Name	Class C (ft^3)
PERKINELMER, INC.	37.5
ENTERGY PNPS	15

Table 55. Top Class C Volume Generators in Calendar Year 2012

Facility Name	Class C (ft^3)
PERKINELMER, INC.	15
ENTERGY PNPS	15

Table 56. Top Class C Volume Generators in Calendar Year 2013

Facility Name	Class C (ft^3)
PERKINELMER, INC.	82.5
ENTERGY PNPS	15

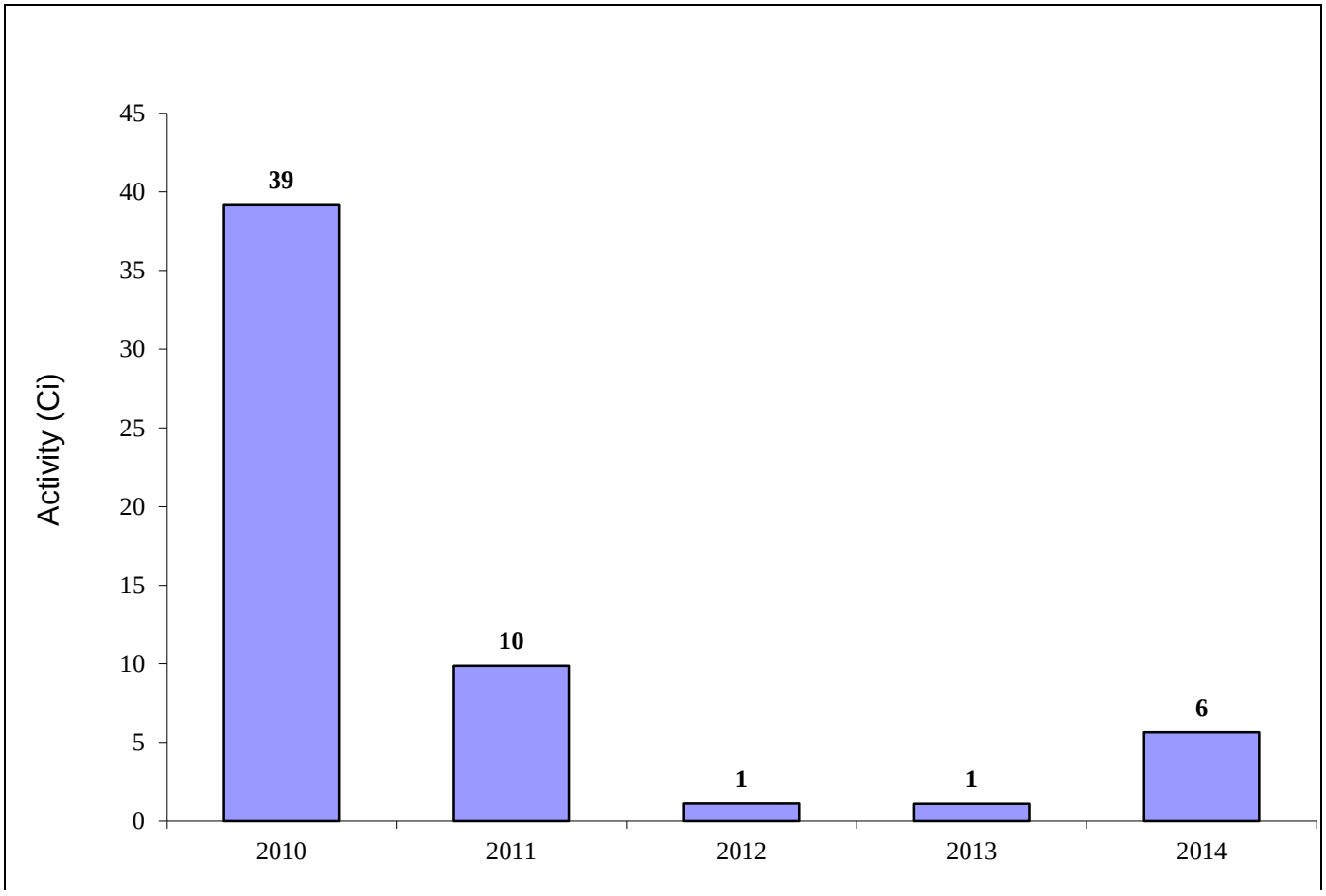
Table 57. Top Class C Volume Generators in Calendar Year 2014

Facility Name	Class C (ft^3)
PERKINELMER, INC.	45
BEVERLY MICROWAVE DIVISION	34

2.9. HVLA LLRW by Radioactivity

2.9.1. All HVLA by Radioactivity

Figure 11 - All HVLA by Radioactivity



- HVLA radioactivity levels are highly reliant upon decommissioning projects, which are unpredictable (e.g., U.S. Army Corps of Engineers).
- U.S. Army Corps of Engineers generated the most HVLA from 2010-2011.
- PerkinElmer, Inc. generated the most HVLA from 2012-2013.
- Morpho Detection, LLC generated the most HVLA in 2014.

2.9.2. HVLA Radioactivity by Waste Generator Category

Table 58. HVLA Radioactivity (Ci) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	0				
Commercial	4.53	3.24e-02	1.11	1.10	5.64
Government	34.61	9.84			
Health	0	6.99e-04	3.87e-03	1.00e-07	

- The Government category dominates HVLA radioactivity generation (e.g., U.S. Army Corps of Engineers involvement in the Shpack landfill cleanup).

- The following Commercial facilities reported the most HVLA: Boston Heart Diagnostics, Charm Sciences, Inc., Morpho Detection, LLC, and PerkinElmer, Inc.

2.9.3. HVLA Radioactivity by Facility Type

Table 59. HVLA Radioactivity (Ci) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	34.61	9.84		1.00e-07	
Private, Non-Profit	0	6.99e-04	3.87e-03		
Private, Profit	4.53	3.24e-02	1.11	1.10	5.64
State Education Facility	0				

- The Federal Agency category dominates HVLA radioactivity generation (e.g., U.S. Army Corps of Engineers involvement in the Shpack landfill cleanup).

- The 2010 Private, Profit HVLA radioactivity generation was largely due to PerkinElmer, Inc., who appeared to be using this decommissioning created class of waste for some of their routine disposals.

- The following Private, Profit facilities reported the most HVLA: Boston Heart Diagnostics, Charm Sciences, Inc., Morpho Detection, LLC, and PerkinElmer, Inc.

2.9.4. Top HVLA Radioactivity Generators from CY 2010-2014

Table 60. Top HVLA Radioactivity Generators in Calendar Year 2010

Facility Name	HVLA (Ci)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	34.61
PERKINELMER, INC.	4.50
AREVA NP, INC.	0.03

Table 61. Top HVLA Radioactivity Generators in Calendar Year 2011

Facility Name	HVLA (Ci)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	9.84
CHARM SCIENCES INC.	0.01
LONZA BIOLOGICS, INC.	0.006

Table 62. Top HVLA Radioactivity Generators in Calendar Year 2012

Facility Name	HVLA (Ci)
PERKINELMER, INC.	1.10
PHILOTECHNICS, LTD	0.006
DANA-FARBER CANCER INSTITUTE	0.003

Table 63. Top HVLA Radioactivity Generators in Calendar Year 2013

Facility Name	HVLA (Ci)
PERKINELMER, INC.	1.10
MICROTEST LABORATORIES, INC.	0.003
CHARM SCIENCES INC.	0.001

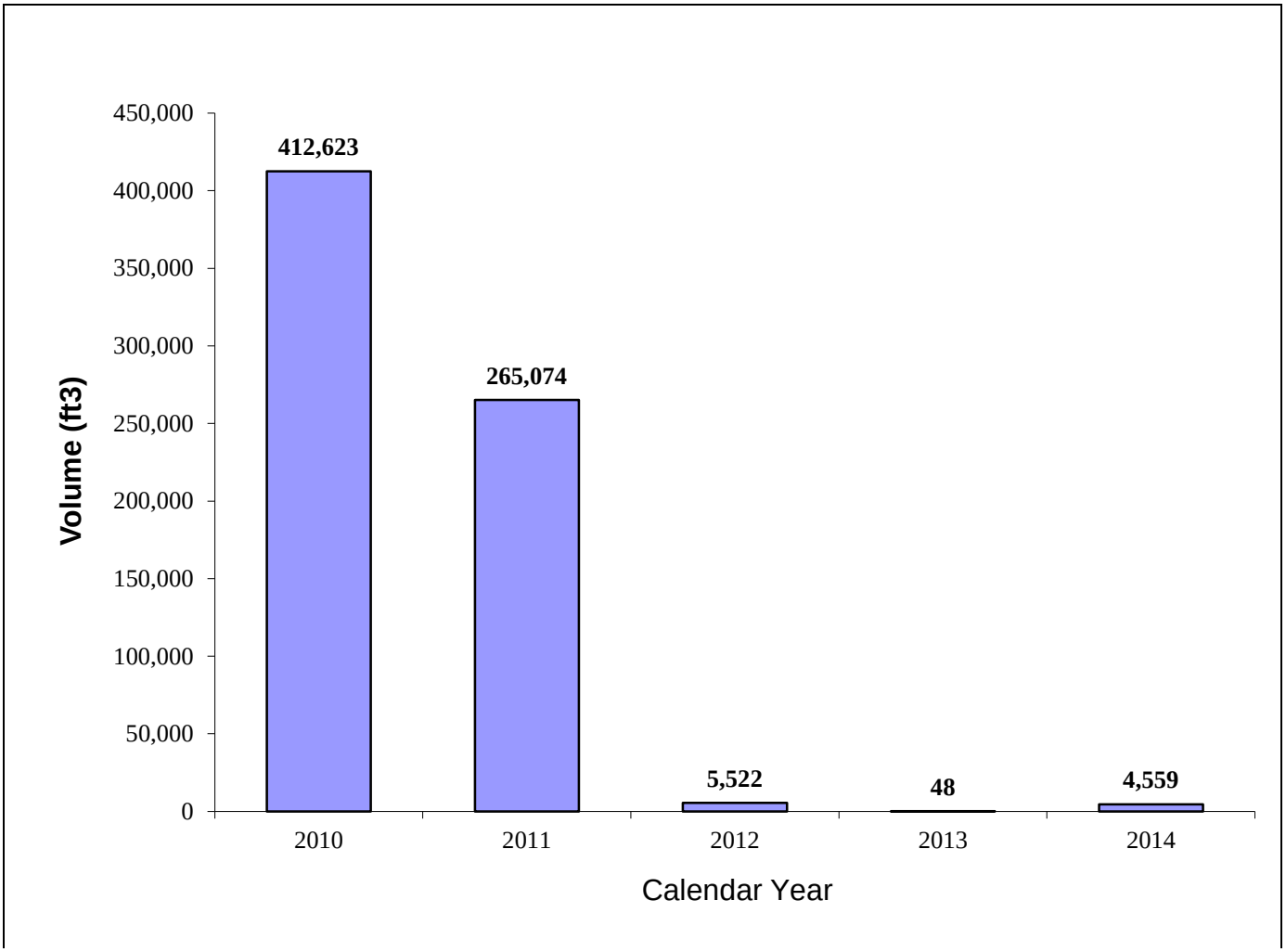
Table 64. Top HVLA Radioactivity Generators in Calendar Year 2014

Facility Name	HVLA (Ci)
MORPHO DETECTION, LLC	4.56
BOSTON HEART DIAGNOSTICS	0.84
BARTLETT NUCLEAR, INC.	0.22

2.10. HVLA LLRW by Volume

2.10.1. All HVLA by Volume

Figure 12 - All HVLA by Volume



- HVLA volumes are highly reliant upon decommissioning projects, hence trending is difficult (e.g., U.S. Army Corps of Engineers).

- In 2014, the following facilities generated the most HVLA volume:
    1. Bartlett Nuclear, Inc – 2,560 ft3;
    2. Morpho Detection, LLC – 1,509 ft3;
    3. Boston Heart Diagnostics – 420 ft3

2.10.2. HVLA Volume by Waste Generator Category

Table 65. HVLA Volume (ft^3) by Waste Generator Category

	2010	2011	2012	2013	2014
Academic	0				
Commercial	214	294.86	4,161	43.34	4,559
Government	412,409	264,779			
Health	0	0.51	1,360	5.06	

- All the Government HVLA volume generation is attributed to the Shpack landfill decommissioning project, which was led by the U.S. Army Corps of Engineers.

- In 2012, Philotechnics, Ltd. generated 4,085 ft3 out of 4,161 ft3 of HVLA; Dana-Farber Cancer Institute produced 1,360 ft3 of HVLA.

- Commercial facilities generated the majority of HVLA in 2014 –

    - Bartlett Nuclear, Inc – 2,560 ft3;
    - Morpho Detection, LLC – 1,509 ft3;
    - Boston Heart Diagnostics – 420 ft3

2.10.3. HVLA Volume by Facility Type

Table 66. HVLA Volume (ft^3) by Facility Type

	2010	2011	2012	2013	2014
Federal Agency	412,409	264,779		5.06	
Private, Non-Profit		0.51	1,360		
Private, Profit	214	294.86	4,161	43.34	4,559
State Education Facility	0				

- All the Federal Agency HVLA volume generation is due to the Shpack landfill decommissioning project, which ended in 2010.

- Private, Non-Profit and Private, Profit generated the most HVLA volume in 2012 and 2014, respectively.

2.10.4. Top HVLA Volume Generators from CY 2010-2014

Table 68. Top HVLA Volume Generators in Calendar Year 2010

Facility Name	HVLA (ft^3)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	412,409
AREVA NP, INC.	190
CHARM SCIENCES INC.	15

Table 69. Top HVLA Volume Generators in Calendar Year 2011

Facility Name	HVLA (ft^3)
US ARMY CORPS OF ENGINEERS, SHPACK SUPERFUND/FUSRAP SITE	264,779
PLANSEE USA, LLC	143
LONZA BIOLOGICS, INC.	45

Table 70. Top HVLA Volume Generators in Calendar Year 2012

Facility Name	HVLA (ft^3)
PHILOTECHNICS, LTD	4,085
DANA-FARBER CANCER INSTITUTE	1,360
LONZA BIOLOGICS, INC.	35.8

Table 71. Top HVLA Volume Generators in Calendar Year 2013

Facility Name	HVLA (ft^3)
MICROTEST LABORATORIES, INC.	34.77
PERKINELMER, INC.	7.50
HEALTH & HUMAN SERVICES, DEPT. OF	5.06

Table 72. Top HVLA Volume Generators in Calendar Year 2014

Facility Name	HVLA (ft^3)
BARTLETT NUCLEAR, INC.	2,560
MORPHO DETECTION, LLC	1,509
BOSTON HEART DIAGNOSTICS	420

3. NATIONAL DATA

Commercial disposal of LLRW in the U.S. has been nationally tabulated in the Manifest Information Management System (MIMS) since 1998; the database was developed for and is maintained by the U.S. Department of Energy (DOE) in response to provisions in 42 U.S.C. 2021g(a). The data in MIMS comes from waste manifests shipments to one closed LLRW disposal facility (i.e. Beatty, Nevada) and three operating commercial LLRW disposal facilities (U.S. Ecology [Richland, Washington], Duratek / Chem Nuclear [Barnwell, South Carolina], and Energy Solutions, formerly Envirocare of Utah [Clive, Utah]).

Reports in MIMS contain information on LLRW volume, radioactivity, and number of shipments to each facility. Waste generators are not specifically identified in MIMS but instead are given a unique code indicating the state of origin. Some shipments include waste from multiple states and or waste generators which are delivered via brokers or waste processors.

The scope of the data in MIMS is limited to LLRW from utilities, industries including waste brokers/processors, academic/research institutions, medical facilities, and government (state and Federal agencies outside DOE). MIMS data can be found at http://mims.apps.em.doe.gov/.

According to MIMS data, all LLRW generated in Massachusetts from 2010-2014 was received at Envirocare in Clive, Utah due to the closure of Barnwell, SC (2008) and Hanford, WA (1992) sites to non-compact members. However, the MIMS data does not show is where Massachusetts' Class B & C waste is received, since Envirocare only accepts Class A waste. It is possible that Massachusetts' Class B & C waste is being treated then disposed as Class A or temporarily stored on site or at a waste broker's facility.

4. FINANCIAL DATA

Funds to manage the requirements of M.G.L. Chapter 111H (Massachusetts Low-Level Radioactive Waste Management Act), as amended, require the assessment of an annual fee on licensees and registrants. Pursuant to M.G.L. Chapter 111H, section 4A, the Low-Level Radioactive Waste Management Board shall annually assess each person licensed or registered to receive, possess, use, transfer or acquire radioactive materials in the Commonwealth, amounts sufficient to defray the costs annually incurred by the board for such purposes.

Any unpaid assessments are charged interest at 12% per annum on and after the due date, which is 90 days from the invoice date. After 180 days any outstanding fee users are issued a collection letter and subject to intercept of any state payments or tax refunds.

Cities and towns are exempt from the annual LLRW fees per M.G.L. Chapter 29, section 27C, however municipalities must still submit the annual LLRW survey when requested.

Pursuant to 345 CMR 4.03(2), the annual LLRW fee is a function of volume, class, and activity of waste generated per year, as shown in the equation below:

$$\text{Annual Fee} = FF + \{[(CRF)*(CA + 3CB + 5CC)]*(PF)\} + [(HVLA*(PF_{HVLA})]$$

Where:

FF - Flat Fee. Currently $100 for XRF only licenses; $150 for all other licenses.

CRF - Classification of Radioactivity Factor. Varies from 1.0 to 1.3 depending on the gross activity generated (excluding HVLA waste) - See Table 73 below.

CA - Class A LLRW volume in ft^3.

CB - Class B LLRW volume in ft^3.

CC - Class C LLRW volume in ft^3.

PF - Proportional Fee for Class A, B, and C Wastes - Currently set at $5.10/ ft^3.

PF_{HVLA} - Proportional Fee for HVLA Waste - Currently set at $1.275/$ft^3$.

HVLA- Volume of HVLA waste in ft^3.

Table 73. Classification of Radioactivity Factor (CRF) per 345 CMR 4.03B table

Radioactivity of Waste Shipped for Disposal Off Site, or Stored for Later Disposal	Classification of Radioactivity Factor (CRF)
Less than 1.0 Ci/year	1.0
1.0 curie/year or more but less than 10.0 Ci/year	1.1
10.0 Ci/year or more but less than 100.0 Ci/year	1.2
100.0 Ci/year or more	1.3

U.S. DOE FUNDING

The Massachusetts Department of Public Health, Radiation Control Program, received no federal funding from 2010-2014, pursuant to the federal Low-Level Radioactive Waste Policy Act, as amended (P.L. 99-240). The funds were collected by certain LLRW disposal sites as a surcharge to use these disposal sites. The funds are held by DOE, and rebated to various states based upon their success in meeting milestones outlined in federal law. Since Massachusetts ceased its disposal siting activities in 1996 and remains an unaffiliated disposal state, no funds were received during the time frame of this report.

Appendix A - Glossary of Terms

Broker — A person engaged in the business of arranging for the collection, transportation, treatment, storage or disposal of low-level radioactive waste.

High Volume, Low Activity (HVLA)
Soils or demolition rubble waste that have average concentrations of radioactive material less than or equal to the concentrations set forth in 345 CMR 1.13, Table 1.13B and that have been accepted for disposal at a licensed LLRW disposal facility.

Licensee — A person holding a license issued pursuant to Part C of 105 CMR 120.000 by DPH or a license issued by the U.S. Nuclear Regulatory Commission to transfer, acquire, own, possess or use quantities of, or devices or equipment utilizing, radioactive material.

Low-Level Radioactive Waste (LLRW)
Radioactive material that (1) is neither high level waste, nor spent nuclear fuel, nor byproduct material as defined in § 11(e)(2) of the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2014(e); and (2) is classified by the Federal Government as low-level radioactive waste, but not including waste which remains a Federal responsibility, as designated in § 3(b) of the Low-Level Radioactive Waste Policy Act, as amended, 42 U.S.C. § 2021c(b), as in effect as of December 8, 1987.

RCRA Corrective Action (RCRA) sites
Facilities that treat, store, and/or dispose of hazardous wastes. These facility owners are required to clean up environmental contaminants released into soil, ground water, surface water, and air at their sites under the Resource Conservation and Recovery Act (RCRA).

Shallow Depth Disposal
A land disposal method that relies on the sites' natural characteristics as the primary barrier for isolation of the waste.

Appendix B - Commercial Low Level Radioactive Waste - Recent History

Low Level Radioactive Waste Policy Act (LLRWPA)

By the late 1970s, only three disposal facilities accepted commercially produced LLRW in the United States; these facilities were located in South Carolina, Nevada, and Washington state. In response to advocacy from these states, Congress passed the Low Level Radioactive Waste Policy Act (LLRWPA) in 1980 (P.L. 96-573). The act established that:

1. Each state is responsible for the LLRW generated within its boundaries;

2. States were encouraged to form multi-state compacts to facilitate managing LLRW generated within the boundaries of the compact states; and,

3. The right of regional compacts to prohibit disposal at their regional facilities of LLRW generated in non-compact states after January 1, 1986.

Low-Level Radioactive Policy Amendments Act (LLRWPAA)

Amendments to the LLRWPA were passed in 1986 in the form of the Low-Level Radioactive Policy Amendments Act (LLRWPAA) (Public Law 99-240).. In short, the LLRWPAA :

1. Extended the original January 1, 1986 deadline to develop new disposal facilities by seven years to January 1, 1993. At which time the existing facilities could decline commercial LLRW from non-compact states;

2. Established new milestones and deadlines. Failure to reach a deadline allowed the states operating disposal facilities (still SC, NV, and WA) authorization to deny disposal access to those states in violation of the milestones;

3. Established financial penalties on waste disposed of at existing disposal facilities if certain milestones were not met;

4. The Department of Energy (DOE) was assigned the task of:
    A. Collection of and disbursal of LLWRPAA-levied surcharges;
    B. Assigned responsibility for disposing GTCC waste;
    C. Provide financial and technical assistance to the states and compacts;
    D. Prepare certain status reports on the management of national LLRW inventories (e.g., Manifest Information Management System (MIMS)); and,

5. The Nuclear Regulatory Commission (NRC) was required to do the following:
    A. Review all LLRW disposal facility license applications;
    B. Develop standards and procedures for exempting certain LLRW from disposal in licensed facilities;
    C. Provide regulatory and technical assistance to Agreement States; and,
    D. Determine procedures for granting emergency access to LLRW facilities for wastes generated in other regions.

As a non-compact state, Massachusetts was required to develop a regulatory framework compatible with the requirements of 10 CFR Part 61, as well as other NRC guidance. Hence, in 1987, Massachusetts enacted M.G.L. Chapter 111H. One of the requirements was for the establishment of an LLRW Board to oversee the siting of an LLRW facility in Massachusetts. In 2002, M.G.L. Chapter 111H was amended to abolish the LLRW Board and authorize the Department of Public Health, Bureau of Environmental Health, RCP to regulate the management of low-level radioactive waste. Complete copies of the general law are available at http://www.mass.gov/legis/laws/mgl/gl-111h-toc.htm.

Federal Government

From 1979 to 2000, the Department of Energy (DOE) sponsored publication of an annual state-by-state assessment report that provided information on the types and quantities of commercial LLRW being generated. Additionally, in 1986, DOE developed the Manifest Information Management System (MIMS) to monitor the management of commercial LLRW. The database essentially replaced the annual state-by-state assessment report series. In 2000, Congress stopped appropriating funds for DOE's national LLRW program with the exception of the funds necessary to maintain MIMS.

As part of its regulatory oversight function, the NRC attends regular meetings of the Low-Level Radioactive Waste Forum, monitors Agreement States' progress implementing LLRWPAA milestones, and has increased transparency in its decision-making.

Since 2001, a site near Grand View, ID (operated by U.S. Ecology) accepts commercial NARM, NORM, certain NRC-exempt items and devices, radiological-contaminated waste from NRC or NRC Agreement State licensees to be disposed of if the material has been specifically exempted from regulation according to a clearly described set of waste acceptance criteria established by U.S. Ecology and approved by the state.

From 2010-2014, there were four LLRW disposal sites in the United States: Hanford, WA, Barnwell, SC, Clive, UT, and Andrews, TX. Clive, UT (operated by Energy Solutions) was only accepting Class A LLRW waste from out-of-state sources. Massachusetts LLRW has not been accepted at Hanford, WA since 1992, and Barnwell, SC since July 1, 2008.

Commonwealth of Massachusetts

In 2004, the Government Accountability Office (GAO) determined shortcomings in the quality of the MIMS data and recommended that the NRC take responsibility for generating the required reports. Furthermore, LLRW sent to the new Andrews, TX (operated by Waste Control Specialists) site is not maintained in MIMS. Since the reliability of the MIMS data is in question, Massachusetts continues to survey its LLRW generators and maintain a separate database, to assist in forecasting future disposal needs.

Appendix C - Massachusetts LLRW Classes

The NRC has defined four classes of LLRW (e.g. Class A, B, C, and Greater Than Class C (GTCC)) each with specified disposal and waste requirements based on its potential hazard. These classes have progressively higher concentrations of radioactive material, with A having the lowest and C having the highest level. Class A waste accounts for more than 95% of the total volume of LLRW in the United States.

The fourth class of LLRW, GTCC, is not generally acceptable for near-surface, shallow-depth disposal, hence, the LLRW Policy Act of 1985 assigned the Federal Government (i.e. DOE) responsibility for the disposal of GTCC LLRW that results from NRC and Agreement State licensed activities. Thus, the volume and activity of GTCC generated in Massachusetts is not surveyed or tracked.

Massachusetts uses an additional class of LLRW called High Volume, Low Activity (HVLA) waste. It is anticipated that much of this waste will be produced by decommissioning nuclear licensed sites and will typically include soils & rubble with low concentrations (e.g. 100 pCi/g) of total activity that have the potential to be disposed in non-LLRW landfill sites, such as a Resource Conservation and Recovery Act (RCRA) Subtitle C or D site; else, this waste would be classified as Class A.

Thus, Massachusetts annual LLRW survey has four classes: HVLA, Class A, Class B, and Class C. The determination of the classification of waste is a complex process and has been codified in 345 CMR 1.12 (i.e., 105 CMR 120.299) for Class A, B, and C, and HVLA waste as described in 345 CMR 1.13.

Appendix D - Waste Generator Category Descriptions

Massachusetts uses essentially the same five waste generator categories as the DOE's MIMS database system: Academic, Commercial, Government, Health, and Utility (MIMS calls these categories: Academic, Industry, Government, Medical, and Utility, respectively). All entities that submit a LLRW survey is assigned just one waste generator category, as described below:

Academic	all institutions of learning (i.e., colleges, universities, etc.) are assigned this category, regardless if the entity is commercial or not.
Commercial	all for-profit entities not designated as a Health, Utility, or Academic generator category.
Government	all entities which are closely affiliated, generally by government ownership or control, with Federal, State and local governments.
Health	all entities supplying medical patient services regardless if it is for-profit or not. Generally this category will include all hospitals, medical clinics, etc.
Utility	all entities which supply electrical power regardless if it is for-profit or not. This includes any private, public, or government-owned nuclear power plant.

Appendix E - Facility Type Descriptions

To further analyze the submitted LLRW data, Massachusetts further classifies each entity with a facility type designation, as follows:

Federal Agency -	all entities which are closely affiliated, generally by government ownership or control, with the Federal government.
State Agency -	all entities which are closely affiliated, generally by government ownership or control, with the State government, excluding State Education facilities.
State Education -	all education (i.e., colleges, universities, etc.) entities which are closely affiliated, generally by government ownership or control, with the State government.
Municipality -	all entities which are closely affiliated, generally by government ownership or control, with local government (i.e., city, town, board of health, etc.).
Private, Profit -	any for-profit entity.
Private, Non-Profit -	any non-profit entity that is not government affiliated.

Appendix F - Acronyms

CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
GTCC	Greater than Class C
HVLA	High Volume, Low Activity (radioactive waste)
LLRW	Low Level Radioactive Waste
MDPH	Massachusetts Department of Public Health
MIMS	Manifest Information Management System
RCP	Massachusetts Radiation Control Program
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
RCRA	Resource Conservation and Recovery Act
XRF	X-ray Fluorescence