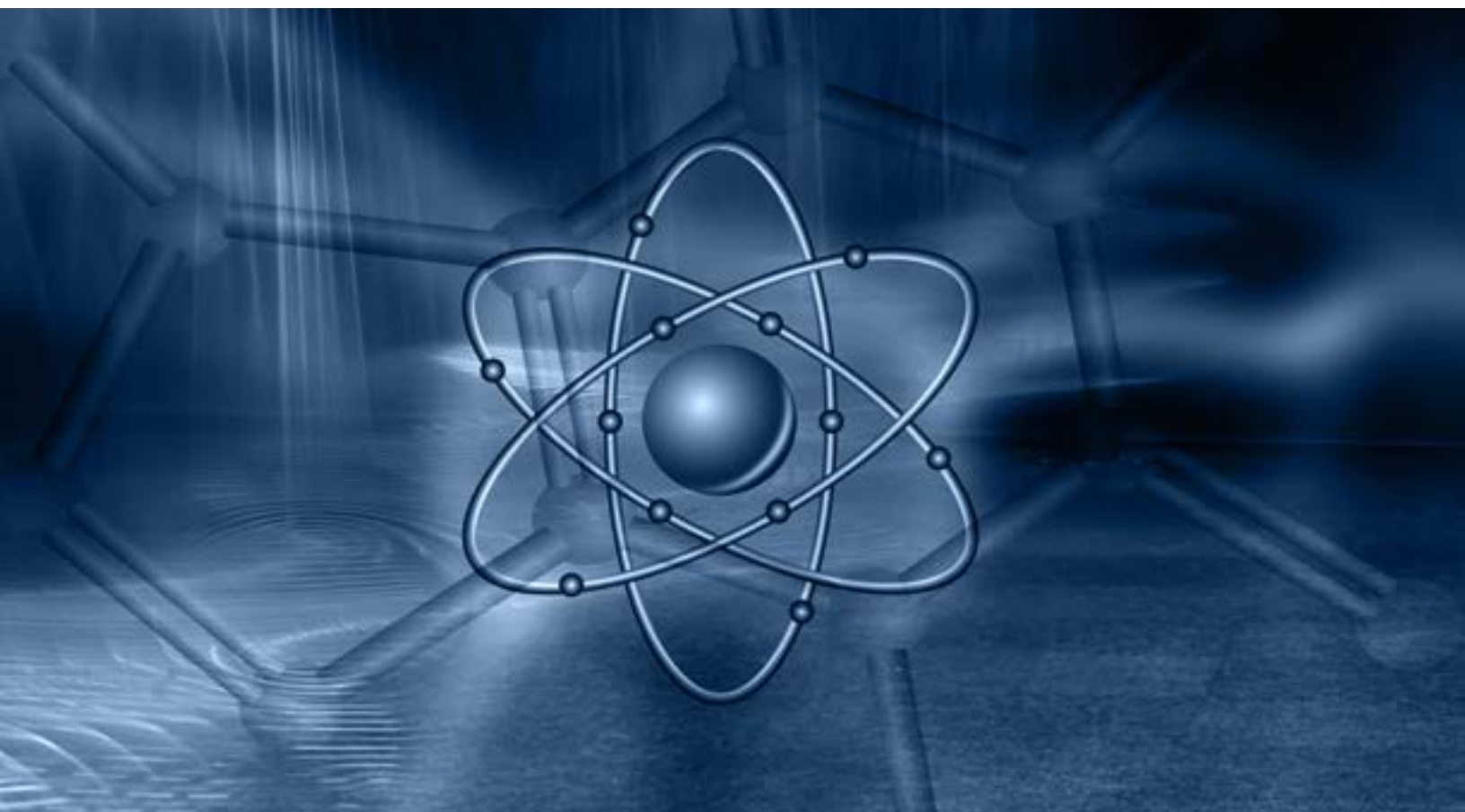


# New York State Low-Level Radioactive Waste Status Report for 2019

Final Report | July 2020



## **NYSERDA's Promise to New Yorkers:**

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

### **Mission Statement:**

Advance innovative energy solutions in ways that improve New York's economy and environment.

### **Vision Statement:**

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

# **New York State Low-Level Radioactive Waste Status Report for 2019**

*Final Report*

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July 1, 2020



# Table of Contents

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<b>1</b>	<b>Introduction .....</b>	<b>1</b>
<b>2</b>	<b>Low-Level Radioactive Waste Disposed by New York State Generators in 2019.....</b>	<b>3</b>
Table 1	Generators Reporting and Disposing Waste .....	4
Table 2	Volume and Radioactivity of Waste Disposed .....	5
Table 3	Waste Disposed by Class and Generator Type .....	6
Table 4	Distribution of Waste Among Disposal Facilities .....	7
Table 5	Waste Disposed by County of Origin .....	8
Table 6	Radionuclide Content of Waste Disposed .....	10
Table 7	Number of Facilities Disposing Various Waste Types .....	12
<b>3</b>	<b>Low-Level Radioactive Waste in Storage (as of December 31, 2019) .....</b>	<b>13</b>
Table 8	Generators Reporting and Storing Waste Pending Disposal .....	14
Table 9	Volume and Radioactivity of Waste Stored Pending Disposal .....	15
Table 10	Waste in Storage Pending Disposal by Class and Generator Type .....	16
Table 11	Number of Facilities Reporting Storage of Various Waste Types Pending Disposal.....	17
Table 12	Waste in Storage Pending Disposal by County of Origin .....	18
Table 13	Radionuclide Content of Waste in Storage Pending Disposal .....	20
Table 14	Waste Reported in Storage for Decay by Generator Type .....	22
<b>4</b>	<b>Historic Data and Projections for Low-Level Radioactive Waste Generation in New York State .....</b>	<b>23</b>
Table 15	Historic Overview of Waste Disposal by Volume .....	24
Table 16	Historic Overview of Waste Disposal by Radioactivity .....	24
Figure 1	Historic Overview of Waste Disposal by Volume .....	25
Figure 2	Historic Overview of Waste Disposal by Radioactivity .....	25
Table 17	Generators' Five-Year Projections of Waste by Volume .....	26
Table 18	Generators' Five-Year Projections of Waste by Radioactivity .....	26
<b>Appendix A:</b>	<b>Conversions for Units .....</b>	<b>A-1</b>



# 1 Introduction

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This report summarizes data on low-level radioactive waste (LLRW)<sup>1</sup> generated in New York State.<sup>2</sup> It is based on reports from generators<sup>3</sup> that file annually with the New York State Energy Research and Development Authority (NYSERDA). The New York State Low-Level Radioactive Waste Management Act<sup>4</sup> (State Act) requires LLRW generators in the State to submit annual reports to NYSERDA that provide detailed information on waste generated, stored, and disposed. To facilitate compliance, NYSERDA developed report forms that can be downloaded from [nyserdera.ny.gov](http://nyserdera.ny.gov). Generators without internet access are provided paper copies upon request. This is the 34th year that generators have submitted such reports to NYSERDA.

The State Act requires NYSERDA to prepare an annual report summarizing—by type of generator and county—the nature, characteristics, and quantities of LLRW generated in the State. This report is designed to meet that requirement and summarizes the most recent year’s data in a series of tables and figures. Section 2 reports volume, radioactivity,<sup>5</sup> and other characteristics of waste disposed in 2019. Section 3 summarizes volume, radioactivity, and other characteristics of waste held in storage pending future disposal as of December 31, 2019. Section 3 also summarizes the volume of waste held in storage for decay and subsequent disposal as nonradioactive waste as of December 31, 2019. Such waste may still be subject to special disposal requirements due to other hazardous characteristics (e.g., regulated medical waste). Section 4 shows historical LLRW generation data and includes generators’ projections of waste quantities for the next five years.

In this report, volume is presented in cubic meters and radioactivity is presented in gigabecquerels (GBq) or megabecquerels (MBq). These units have been adopted to be consistent with U.S. Nuclear Regulatory Commission uniform national LLRW manifest requirements. Information for converting the data to cubic feet and curies is provided in footnotes throughout the report and the conversion tables in Appendix A.

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<sup>1</sup> Low-level radioactive waste is one category of waste produced through processes using radioactive materials. In the U.S., radioactive wastes are classified according to a number of different categories by federal law and U.S. Nuclear Regulatory Commission (NRC) regulations.

<sup>2</sup> Waste generated by certain federal installations and programs, such as the Brookhaven National Laboratory, the Knolls Atomic Power Laboratory, and West Valley Demonstration Project, are not included in this report nor in the requirements for generator reporting to NYSERDA. Under the federal Low-Level Radioactive Waste Policy Act, as amended in 1985 (Public Law 99-240), the federal government is responsible for disposal of LLRW owned and generated by the U.S. DOE, the U.S. Navy, as a result of decommissioning vessels, and the federal government, as a result of research, development, testing, and production of nuclear weapons.

<sup>3</sup> “Generator” is defined in 21 NYCRR Part 502.2(e) as “A person who by his actions within New York, or through the actions within New York of any agent, employee, or independent contractor, generates low-level radioactive waste.”

<sup>4</sup> New York Public Authorities Law. §1854-d(1) (McKinney’s Consolidated Laws of New York, 2000).

<sup>5</sup> Radioactivity is the measure of a material’s propensity to emit radiation, or the number of radiation-emitting events occurring each second.





## 2 Low-Level Radioactive Waste Disposed by New York State Generators in 2019

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This section summarizes data reported by LLRW generators in the State on waste transferred to licensed LLRW disposal facilities in Clive, Utah (Energy Solutions); Richland, Washington (U.S. Ecology); and Andrews, Texas (Waste Control Specialists) during 2019. LLRW is categorized as Class A, B, or C. These categories were established originally by the U.S. Nuclear Regulatory Commission in Title 10 of the Code of Federal Regulations, Part 61, “Licensing Requirements for Land Disposal of Radioactive Waste” and have since been adopted by the New York State Department of Environmental Conservation in 6 NYCRR Part 382, “Regulations for Low-Level Radioactive Waste Disposal Facilities.” Class A contains the lowest concentration of short- and long-lived radioactive materials and represents the largest class by volume produced in the State. On the other end of the spectrum, Class C waste contains the greatest concentration of long-lived radioactive material, and although normally the smallest in terms of volume generated, usually contains the greatest amount of radioactivity. Class B, as the name suggests, is an intermediate category.

The Clive facility can accept most Class A waste, but cannot accept Class B or C waste. The Clive facility can also accept, treat, and dispose of most solid, mixed waste (i.e., LLRW that also contains other hazardous constituents) that meets the site’s radioactivity concentration limits. The Richland facility is authorized to accept limited volumes of LLRW containing small quantities of naturally occurring radioactive material (e.g., radium, uranium, and thorium) from State generators. The Andrews facility accepts Class A, B, and C waste.

In 2019, generators in the State reported disposing 919 cubic meters (32,436 cubic feet) of LLRW containing 81,917 GBq (2,214 curies) of radioactivity. About 98.8% of the volume, containing 13.2% of the radioactivity, was shipped to the Clive facility. The Andrews facility received 1.2% of the volume, containing 86.8% of the radioactivity. No waste was shipped to the Richland facility.

In general, variability in volume and activity of LLRW disposed is primarily a function of refueling and maintenance activities at nuclear power plants. The increase in disposal in 2015 and 2016 can be attributed to three separate disposal actions; decommissioning of a university research reactor and disposal of both irradiated hardware and a large volume of resin from one of the nuclear power plants.

Individual entries in the following tables are rounded using standard practices as described. The totals shown represent the sum of the rounded entries; therefore, they may vary from one table to another and not always equal 100%. Waste volumes are rounded to the nearest tenth of a cubic meter. In most cases, radioactivity is rounded to the nearest 10,000th of a GBq. Percentages are rounded to the nearest tenth of a percent in the table and figures.

**Table 1. Generators Reporting and Disposing Waste<sup>6</sup>**

<b>Generator Type</b>	<b>Number Reporting</b>	<b>Number Disposing</b>
<b>Medical</b>		
Government	6	2
Private	115	9
College	12	9
Other	16	0
<b>Total Medical</b>	<b>149</b>	<b>20</b>
<b>Industrial</b>		
Manufacturing	8	5
Research and Development	2	2
Other	1	1
<b>Total Industrial</b>	<b>11</b>	<b>8</b>
<b>Academic (nonmedical)</b>		
College or University	25	12
Other	2	1
<b>Total Academic</b>	<b>27</b>	<b>13</b>
<b>Government (nonmedical)</b>		
New York State	3	1
Other	3	0
<b>Total Government</b>	<b>6</b>	<b>1</b>
<b>Total Nonpower Plant</b>	<b>193</b>	<b>42</b>
<b>Nuclear Power Plant</b>	<b>6</b>	<b>6</b>
<b>Total</b>	<b>199</b>	<b>48</b>

<sup>6</sup> Disposal refers to generators that reported transferring any class of LLRW directly or via brokers or processors to one of the able licensed LLRW disposal facilities. LLRW generators that did not dispose waste are either storing waste for future disposal or storing waste for decay and subsequent disposal as non-radioactive waste. Section 3 addresses storage in detail.

**Table 2. Volume and Radioactivity of Waste Disposed<sup>7</sup>**

Generator Type	Volume <sup>8</sup> (m <sup>3</sup> )	% of Total	Radioactivity <sup>8</sup> (GBq)	% of Total
<b>Medical</b>				
Government	0.5		4.9178	
Private	5.9		1.4897	
College	7.2		12.8716	
Other	0.0		0.0000	
<b>Total Medical</b>	<b>13.6</b>	<b>1.5</b>	<b>19.2791</b>	<b>*</b>
<b>Industrial</b>				
Manufacturing	20.0		140.4582	
Research and Development	2.2		47.7783	
Other	0.9		88.2543	
<b>Total Industrial</b>	<b>23.1</b>	<b>2.5</b>	<b>276.4908</b>	<b>0.3</b>
<b>Academic (nonmedical)</b>				
College or University	12.9		18.228	
Other	0.2		0.1591	
<b>Total Academic</b>	<b>13.1</b>	<b>1.4</b>	<b>18.3871</b>	<b>*</b>
<b>Government (nonmedical)</b>				
New York State	1.2		0.5370	
Other	0.0		0.0000	
<b>Total Government</b>	<b>1.2</b>	<b>0.1</b>	<b>0.5370</b>	<b>*</b>
<b>Total Nonpower Plant</b>	<b>51.0</b>	<b>5.5</b>	<b>314.6940</b>	<b>0.4</b>
<b>Nuclear Power Plant</b>	<b>867.6</b>	<b>94.5</b>	<b>81,602.4098</b>	<b>99.6</b>
<b>Total</b>	<b>918.6</b>	<b>100.0</b>	<b>81,917.1038</b>	<b>100.0</b>
	<b>(32,436 ft<sup>3</sup>)</b>		<b>(2,214 curies)</b>	

<sup>7</sup> Refers to all classes of LLRW transferred either directly or via broker or processor to one of the available licensed LLRW disposal facilities.

<sup>8</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1% or 0.1 cubic meters.

**Table 3. Waste Disposed<sup>9</sup> by Class<sup>10</sup> and Generator Type**

Generator Type	Class A		Class B		Class C	
	Volume <sup>11</sup> (m <sup>3</sup> )	Radioactivity <sup>11</sup> (GBq)	Volume <sup>11</sup> (m <sup>3</sup> )	Radioactivity <sup>11</sup> (GBq)	Volume <sup>11</sup> (m <sup>3</sup> )	Radioactivity <sup>11</sup> (GBq)
<b>Medical</b>	13.6	19.2791	0.0	0.0000	0.0	0.0000
<b>Industrial</b>	23.1	229.6488	*	46.8420	0.0	0.0000
<b>Academic</b>	13.1	18.3871	0.0	0.0000	0.0	0.0000
<b>Government</b>	1.2	0.5370	0.0	0.0000	0.0	0.0000
<b>Nuclear Power Plant</b>	857.3	9,105.4513	10.1	71,466.9825	0.2	1,029.9763
<b>Total</b>	<b>908.3</b>	<b>9,373.3030</b>	<b>10.1</b>	<b>71,513.8245</b>	<b>0.2</b>	<b>1,029.9763</b>
	<b>(32,072 ft<sup>3</sup>)</b>	<b>(253 curies)</b>	<b>(357 ft<sup>3</sup>)</b>	<b>(1,933 curies)</b>	<b>(7 ft<sup>3</sup>)</b>	<b>(28 curies)</b>

<sup>9</sup> Refers to LLRW transferred either directly, via brokers, or processors to one of the available licensed LLRW disposal facilities.

<sup>10</sup> Classes A, B, and C are waste-classification categories established by the U.S. Nuclear Regulatory Commission (NRC) in Title 10 of the Code of Federal Regulations, Part 61, “Licensing Requirements for Land Disposal of Radioactive Waste,” and adopted by the New York State Department of Environmental Conservation in 6 NYCRR Part 382, “Regulations for Low-Level Radioactive Waste Disposal Facilities.”

<sup>11</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1 cubic meters, 0.0001 gigabecquerels, 0.1 curies, or 0.1%.

**Table 4. Distribution of Waste Among Disposal Facilities<sup>12</sup>**

<b>Disposal Facility</b>	<b>Volume<sup>13</sup> (m<sup>3</sup>)</b>	<b>% of Total</b>	<b>Radioactivity<sup>13</sup> (GBq)</b>	<b>% of Total</b>
<b>Andrews, Texas</b>	10.6	1.2	71,106.2547	86.8
<b>Clive, Utah</b>	908.0	98.8	10,810.8491	13.2
<b>Richland, Washington</b>	0.0	0.0	0.0000	0.0
<b>Total</b>	<b>918.6</b> <b>(32,436 ft<sup>3</sup>)</b>	<b>100.0</b>	<b>81,917.1038</b> <b>(2,214 curies)</b>	<b>100.0</b>

<sup>12</sup> Refers to all classes of LLRW transferred either directly or via a broker or processor to the respective disposal facility.

<sup>13</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1% or 0.1 cubic meters.

**Table 5. Waste Disposed by County of Origin**

County	Number of Generators Reporting	Number of Generators Disposing LLRW <sup>14</sup>	Volume <sup>15</sup> (m <sup>3</sup> )	% of Total	Radioactivity <sup>15</sup> (GBq)	% of Total
Albany	9	3	1.3	0.1	0.5085	*
Allegany	0	0	0.0	0.0	0.0000	0.0
Bronx	6	4	1.9	0.2	0.8513	*
Broome	1	1	1.0	0.1	*	*
Cattaraugus	1	0	0.0	0.0	0.0000	0.0
Cayuga	0	0	0.0	0.0	0.0000	0.0
Chautauqua	0	0	0.0	0.0	0.0000	0.0
Chemung	2	1	0.3	*	0.0040	*
Chenango	1	0	0.0	0.0	0.0000	0.0
Clinton	0	0	0.0	0.0	0.0000	0.0
Columbia	0	0	0.0	0.0	0.0000	0.0
Cortland	0	0	0.0	0.0	0.0000	0.0
Delaware	0	0	0.0	0.0	0.0000	0.0
Dutchess	8	2	1.5	0.2	0.0480	*
Erie	13	4	20.5	2.2	141.3126	0.2
Essex	0	0	0.0	0.0	0.0000	0.0
Franklin	0	0	0.0	0.0	0.0000	0.0
Fulton	1	0	0.0	0.0	0.0000	0.0
Genesee	2	0	0.0	0.0	0.0000	0.0
Greene	0	0	0.0	0.0	0.0000	0.0
Hamilton	0	0	0.0	0.0	0.0000	0.0
Herkimer	1	0	0.0	0.0	0.0000	0.0
Jefferson	4	0	0.0	0.0	0.0000	0.0
Kings	2	0	0.0	0.0	0.0000	0.0
Lewis	0	0	0.0	0.0	0.0000	0.0
Livingston	2	0	0.0	0.0	0.0000	0.0
Madison	0	0	0.0	0.0	0.0000	0.0
Monroe	8	4	0.6	*	24.0594	*
Montgomery	1	0	0.0	0.0	0.0000	0.0
Nassau	22	1	0.1	*	0.3700	*
New York	18	9	17.2	1.9	4.2132	*
Niagara	3	0	0.0	0.0	0.0000	0.0
Oneida	1	0	0.0	0.0	0.0000	0.0
Onondaga	15	3	0.3	*	0.3854	*

**Table 5. continued**

County	Number of Generators Reporting	Number of Generators Disposing LLRW <sup>14</sup>	Volume <sup>15</sup> (m <sup>3</sup> )	% of Total	Radioactivity <sup>15</sup> (GBq)	% of Total
Ontario	1	0	0.0	0.0	0.0000	0.0
Orange	4	0	0.0	0.0	0.0000	0.0
Orleans	0	0	0.0	0.0	0.0000	0.0
Oswego	4	3	590.1	64.2	70,204.0066	85.7
Otsego	3	0	0.0	0.0	0.0000	0.0
Putnam	2	1	0.1	*	0.0450	*
Queens	6	2	1.0	0.1	88.4156	0.1
Rensselaer	3	0	0.0	0.0	0.0000	0.0
Richmond	4	0	0.0	0.0	0.0000	0.0
Rockland	2	0	0.0	0.0	0.0000	0.0
St. Lawrence	1	0	0.0	0.0	0.0000	0.0
Saratoga	2	0	0.0	0.0	0.0000	0.0
Schenectady	2	0	0.0	0.0	0.0000	0.0
Schoharie	0	0	0.0	0.0	0.0000	0.0
Schuyler	0	0	0.0	0.0	0.0000	0.0
Seneca	0	0	0.0	0.0	0.0000	0.0
Steuben	0	0	0.0	0.0	0.0000	0.0
Suffolk	19	3	0.4	*	5.1937	*
Sullivan	1	0	0.0	0.0	0.0000	0.0
Tioga	0	0	0.0	0.0	0.0000	0.0
Tompkins	3	2	0.1	*	47.8057	*
Ulster	2	0	0.0	0.0	0.0000	0.0
Warren	1	0	0.0	0.0	0.0000	0.0
Washington	0	0	0.0	0.0	0.0000	0.0
Wayne	2	1	22.0	2.4	2,112.3660	2.6
Westchester	15	4	260.2	28.3	9,287.3500	11.3
Wyoming	1	0	0.0	0.0	0.0000	0.0
Yates	0	0	0.0	0.0	0.0000	0.0
<b>Totals</b>	<b>199</b>	<b>48</b>	<b>918.6</b> <b>(32,436 ft<sup>3</sup>)</b>		<b>81,917.1038</b> <b>(2,214 curies)</b>	

<sup>14</sup> Refers to the number of generators that reported transferring all classes of LLRW, either directly or via a broker or processor, to one of the available licensed LLRW disposal facilities.

<sup>15</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1 cubic meter, 0.1%, or 0.0001 GBq.

**Table 6. Radionuclide Content of Waste Disposed<sup>16,17</sup> (MBq)**

Radionuclide	Half-Life <sup>18</sup>	Academic	Government	Industrial	Medical	Nuclear Power Plants	Total
Ag-110m	249.8 d					14,239,823	1.4 E4
Am-241	432.7 y		0.001	204,529		47,268	2.5 E2
Ba-133	10.5 y	0.245			254,290		2.5 E2
Ba-137m	2.5 min					1,599,615	1.6 E3
Be-7	53.3 d					2,082,177	2.1 E3
C-14	5.7 E3 y	419,437	306,880		872,374	33,251,523	3.5 E4
Ca-45	162.7 d	3,700			29,317		3.3 E1
Cd-109	461.0 d	7,400			0.002		7.4 E0
Ce-141	32.5 d					15,947	1.6 E1
Ce-144	284.6 d				4,958	2,176,307	2.2 E3
Cm-242	162.8 d					10,203	1.0 E1
Cm-243	29.1 y					28,620	2.9 E1
Cm-244	29.1 y		0.001			37,649	3.8 E1
Co-57	271.8 d	0.006			4,469,019	21,004,156	2.5 E4
Co-58	70.9 d					492,893,389	4.9 E5
Co-60	5.3 y	0.040			86,945	43,331,777,610	4.4 E7
Cr-51	27.7 d	5,323			7,859	1,700,807	1.7 E3
Cs-134	2.1 y					9,521,004	9.5 E3
Cs-137	30.1 y	73,227	0.001		131,526	471,953,459	5.9 E5
Eu-152	13.5 y				0.001		1.0 E-3
Eu-154	8.6 y				0.003		3.0 E-3
Fe-55	2.7 y	53,946			0.015	23,915,514,524	2.4 E7
Fe-59	44.5 d	1,161				959,321	9.6 E2
Ge-68	270.8 d				21,000		2.1 E1
H-3	12.3 y	11,523,462	230,136	130,226,285	13,034,328	28,450,315	1.8 E5
Hg-203	46.6 d	1,850					1.9 E0
I-125	59.4 d	3,375			14,389		1.8 E1
I-129	1.6 E7 y				3,408	41,737	4.5 E1
I-131	8.0 d			1,850			1.9 E0
Mn 54	312.1 d	0,444			2,394	3,045,975,021	3.1 E6
Mo-99	2.7 d			9,250			9.3 E0
Na-22	2.6 y	0,009			11,323		1.1 E1
Nb-94	2.0 E4 y					18,774	1.9 E1
Nb-95	35.0 d					6,789,650	6.8 E3
Ni-59	7.6 E4 y					93,479,402	9.3 E4
Ni-63	101 y	370,000	0,006	145,877,425		8,277,372,929	8.4 E6
P-32	14.3 d	0,198			0,354		5.5 E-1
Pb-210	22.3 y				0,496		5.0 E-1



**Table 6. continued**

Radionuclide	Half-Life <sup>18</sup>	Academic	Government	Industrial	Medical	Nuclear Power Plants	Total
Po-210	138.4 d			102.246			1.0 E2
Pr-144	17.3 min					14.134	1.4 E1
Pu-238	87.7 y		0.001			46.321	4.6 E1
Pu-239	2.4 E4 y		0.001			13.982	1.4 E1
Pu-240	2.4 E4 y					10.107	1.0 E0
Pu-241	14.4 y					9,354.916	9.4 E3
Ra-226	1.6 E3 y				5.042		5.0 E0
Ru-103	39.3 d			18.500			1.9 E1
S-35	87.2 d	215.350			24.007		2.4 E2
Sb-124	60.2 d					8,191.455	8.2 E3
Sb-125	2.8 y					173,756.074	1.7 E5
Sm-153	1.9 d				222.000		2.2 E2
Sn-113	115.1 d					6,547.898	6.5 E3
Si-89	50.5 d			0.185	1.240	1,031.132	1.0 E3
Si-90	28.8 y	5,702.005	0.003	0.019	3.700	11,270.555	1.7 E4
Te-99m	6.0 h				5.550	768.396	7.7 E2
Te-123m	119.7 d					9.029	9.0 E0
Th-230	7.54 E4y		0.001	0.515			5.1 E-1
Th-232	1.4 E10 y	0.012		45.598	0.037		4.6 E1
Tl-204	3.8 y	0.056			0.036		9.2 E-2
U-233	1.6 E5 y			0.012			1.2 E-2
U-234	2.4 E5 y			3.864			3.9 E0
U-235	7.0 E8 y			0.125			1.2 E-1
U-236	2.3 E7 y			0.016			1.6 E-2
U-238	4.5 E9 y	6.378	0.009	0.327	19.536		2.6 E1
Y-88	106.7 d				4.530		4.5 E0
Y-90	2.67 d		0.003			3.378	3.4 E0
Zn-65	243.8 d				49.580	1,628,883.316	1.6 E6
Zr-95	64 d					11,567.881	1.2 E4
Others <sup>19</sup>	---	---	---	---	---	---	---
<b>Total</b>	<b>Total</b>	<b>18,387.624</b>	<b>537.043</b>	<b>276,490.746</b>	<b>19,279.152</b>	<b>81,602,409.800</b>	<b>8.2 E7</b>

<sup>16</sup> Some generator facilities have reported radionuclides with half-lives of less than 90 days in LLRW disposed. In the majority of these cases, these radionuclides cannot be separated readily from longer-lived radionuclides in the waste. The sum of individual radionuclide radioactivities frequently will not match the overall radioactivity totals reported for waste disposed due to rounding and other approximation techniques. Every effort is made to identify and resolve significant discrepancies.

<sup>17</sup> To obtain radioactivity in curies, divide the number of megabecquerels (MBq) by 37,000.

<sup>18</sup> Source: Chart of the Nuclides, General Electric Company under the direction of Naval Reactors, U.S. DOE, 16th edition, revised to 2002. NB: y=years, m=months, d=days, h=hours.

<sup>19</sup> In certain cases, LLRW generators are permitted by manifest to report a single activity for a group of radionuclides without assigning a value to each; those data are reported here.

**Table 7. Number of Facilities Disposing Various Waste Types<sup>20</sup>**

Waste Type <sup>21</sup>	Medical	Industrial	Academic	Government	Nuclear Power Plants	Total
Activated Material	0	0	0	0	0	0
Aqueous Liquids	3	1	3	1	0	8
Animal Carcasses	2	0	1	0	0	3
Anion Exchange Media	0	0	0	0	0	0
Biological Material (except animal carcasses)	2	0	1	0	0	3
Cation Exchange Medias	1	0	0	0	1	2
Charcoal	0	0	0	0	0	0
Compacted Trash	8	4	4	2	2	20
Contaminated Equipment	0	1	0	2	0	3
Demolition Rubble	1	0	0	0	0	1
Evaporator Bottoms/Sludges/Concentrates	0	1	0	0	1	2
Filter Media	0	1	0	0	2	3
Filter (Mechanical)	0	0	0	0	0	0
Glassware/Labware	4	1	1	0	0	6
Incinerator Ash	0	0	0	0	0	0
Material to be Incinerated	3	1	1	0	0	5
Mixed Bed Ion-Exchange Media	0	0	0	0	2	2
Non-Compacted Trash	2	1	1	0	2	6
Oil	0	0	1	0	0	1
Organic Liquids (excluding oil)	2	0	1	0	0	3
Paint or Plating	0	1	0	0	1	2
Sealed Source/Device	3	3	3	2	0	11
Soil	0	0	0	0	0	0
Other <sup>22</sup>	2	0	2	1	0	5

<sup>20</sup> Refers to the number of generators that reported transferring any class of LLRW directly and via brokers and processors to one of the available licensed LLRW disposal facilities.

<sup>21</sup> Waste types listed are as defined by the U.S. Nuclear Regulatory Commission (NRC) Uniform Manifest. Generators frequently report disposal of several types of waste.

<sup>22</sup> In certain cases, generators reported disposing waste that did not fit into any of the categories listed. Those data are reported here.

### 3 Low-Level Radioactive Waste in Storage (as of December 31, 2019)

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This section provides information on LLRW being stored by generators.

Many generators store LLRW to allow its radioactivity to diminish to levels that permit disposal as nonradioactive waste (i.e., storage for decay). In general, the regulatory agencies with jurisdiction over LLRW in the State allow storage for decay only where the waste contains radionuclides with half-lives of less than 90 days. LLRW in storage for decay is normally held for 10 half-lives or until radioactivity has diminished to a level where it is indistinguishable from background radiation. Most generators hold LLRW in storage for decay at their own facilities, although approved off-site facilities may be used.

Generators also regularly store waste pending future transfer to a licensed LLRW disposal facility (i.e., storage pending disposal). Storage pending disposal can occur for extended periods, as when the Barnwell LLRW disposal facility in South Carolina no longer accepted waste from generators in New York from June 30, 1994 to June 30, 1995. The Barnwell facility again closed to New York as of July 1, 2008, increasing storage needs until the Andrews, Texas facility opened in 2012. Such storage may also occur when the LLRW has a particular characteristic that makes it unacceptable at the available disposal facilities (e.g., contains chemically hazardous components).

For those cases where access to licensed disposal facilities is not available, most generators will store LLRW at their own sites, although approved off-site storage facilities may be used. In addition, most generators routinely store LLRW at their facilities for short periods as a normal part of operation or staging while accumulating a sufficient quantity for transfer to a waste broker or a treatment or disposal facility. Post-storage treatment or processing may significantly reduce the volume of waste requiring final disposal.

Individual entries in the following tables are rounded using standard procedures as described. The totals shown represent the sum of the rounded entries; therefore, they may vary slightly from one table to another and not always equal 100%. Waste volumes are rounded to the nearest tenth of a cubic meter. In most cases, radioactivity is rounded to the nearest 10,000th of a GBq. Percentages are rounded to the nearest tenth of a percent in the tables and figures.

**Table 8. Generators Reporting and Storing Waste Pending Disposal<sup>23</sup>**

<b>Generator Type</b>	<b>Number Reporting</b>	<b>Number Storing</b>
<b>Medical</b>		
Government	6	1
Private	115	6
College	12	2
Other	16	0
<b>Total Medical</b>	<b>149</b>	<b>9</b>
<b>Industrial</b>		
Manufacturing	8	4
Research and Development	2	0
Other	1	1
<b>Total Industrial</b>	<b>11</b>	<b>5</b>
<b>Academic (nonmedical)</b>		
College or University	25	10
Other	2	1
<b>Total Academic</b>	<b>27</b>	<b>11</b>
<b>Government (nonmedical)</b>		
New York State	3	1
Other	3	2
<b>Total Government</b>	<b>6</b>	<b>3</b>
<b>Total Nonpower Plant</b>	<b>193</b>	<b>28</b>
<b>Nuclear Power Plant</b>	<b>6</b>	<b>1</b>
<b>Total</b>	<b>199</b>	<b>29</b>

<sup>23</sup> Includes any class of LLRW reported in storage at generator sites or an approved off-site location pending transfer to a licensed LLRW facility as of December 31, 2019. Does not include LLRW held in storage for decay.

**Table 9. Volume and Radioactivity of Waste Stored Pending Disposal<sup>24</sup>**

<b>Generator Type</b>	<b>Volume<sup>25</sup> (m<sup>3</sup>)</b>	<b>% of Total</b>	<b>Radioactivity<sup>25</sup> (GBq)</b>	<b>% of Total</b>
<b>Medical</b>				
Government	0.3		0.0279	
Private	3.0		0.2056	
College	4.7		0.4430	
Other	0.0		0.0000	
<b>Total Medical</b>	<b>8.0</b>	<b>10.7</b>	<b>0.6765</b>	<b>*</b>
<b>Industrial</b>				
Manufacturing	22.2		330.1184	
Research and Development	0.0		0.0000	
Other	1.8		179.6838	
<b>Total Industrial</b>	<b>24.0</b>	<b>31.9</b>	<b>509.8022</b>	<b>43.1</b>
<b>Academic (nonmedical)</b>				
College or University	4.2		128.4978	
Other	0.4		0.0520	
<b>Total Academic</b>	<b>4.6</b>	<b>6.1</b>	<b>128.5498</b>	<b>10.9</b>
<b>Government (nonmedical)</b>				
New York State	1.4		0.0208	
Other	0.2		0.0350	
<b>Total Government</b>	<b>1.6</b>	<b>2.1</b>	<b>0.0558</b>	<b>*</b>
<b>Total Nonpower Plant</b>	<b>38.2</b>	<b>50.8</b>	<b>639.0843</b>	<b>54.1</b>
<b>Nuclear Power Plant</b>	<b>37.0</b>	<b>49.2</b>	<b>542.0000</b>	<b>45.9</b>
<b>Total</b>	<b>75.2</b>	<b>100.0</b>	<b>1,181.0843</b>	<b>100.0</b>
	<b>(2,655 ft<sup>3</sup>)</b>		<b>(32 curies)</b>	

<sup>24</sup> Includes all classes of LLRW reported in storage at generator sites or an approved off-site location pending transfer to a licensed LLRW facility as of December 31, 2019. Does not include LLRW held in storage for decay.

<sup>25</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1% or 0.1 cubic meters.

**Table 10. Waste in Storage Pending Disposal by Class and Generator Type<sup>26, 27</sup>**

Generator Type	Class A		Class B		Class C	
	Volume <sup>28</sup> (m <sup>3</sup> )	Radioactivity <sup>28</sup> (GBq)	Volume <sup>28</sup> (m <sup>3</sup> )	Radioactivity <sup>28</sup> (GBq)	Volume <sup>28</sup> (m <sup>3</sup> )	Radioactivity <sup>28</sup> (GBq)
Medical	8.0	0.6765	0.0	0.0000	0.0	0.0000
Industrial	24.0	509.8022	0.0	0.0000	0.0	0.0000
Academic	4.6	128.5498	0.0	0.0000	0.0	0.0000
Government	1.6	0.0558	0.0	0.0000	0.0	0.0000
Nuclear Power Plant	37.0	542.0000	0.0	0.0000	0.0	0.0000
<b>Total</b>	<b>75.2</b>	<b>1,181.0843</b>	<b>0.0</b>	<b>0.0000</b>	<b>0.0</b>	<b>0.0000</b>
	<b>(2,655 ft<sup>3</sup>)</b>	<b>(32 curies)</b>	<b>(0.0 ft<sup>3</sup>)</b>	<b>(0 curies)</b>	<b>(0.0 ft<sup>3</sup>)</b>	<b>(0.0000 curies)</b>

<sup>26</sup> Classes A, B, and C are waste-classification categories established by the U.S. Nuclear Regulatory Commission (NRC) in Title 10 of the Code of Federal Regulations, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," and adopted by the New York State Department of Environmental Conservation in 6 NYCRR Part 382, "Regulations for Low-Level Radioactive Waste Disposal Facilities."

<sup>27</sup> Refers to LLRW in storage at generator sites or an approved off-site location pending transfer to a licensed LLRW facility as of December 31, 2019. Does not include LLRW held in storage for decay.

<sup>28</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1% or 0.1 cubic meters.

**Table 11. Number of Facilities Reporting Storage of Various Waste Types Pending Disposal**

<b>Waste Type<sup>29</sup></b>	<b>Medical</b>	<b>Industrial</b>	<b>Academic</b>	<b>Government</b>	<b>Nuclear Power Plants</b>	<b>Total</b>
<b>Activated Material</b>	2	0	0	0	0	2
<b>Animal Carcasses</b>	0	0	0	0	0	0
<b>Anion Exchange Media</b>	0	0	0	0	0	0
<b>Aqueous Liquids</b>	1	0	1	2	0	4
<b>Biological Material (Except Animal Carcasses)</b>	0	0	0	0	0	0
<b>Cation Exchange Media</b>	0	0	0	0	0	0
<b>Contaminated Equipment</b>	0	1	0	0	0	1
<b>Compacted Trash</b>	4	1	1	2	0	8
<b>Demolition Rubble</b>	0	0	0	0	0	0
<b>Evaporator Bottoms/Sludge</b>	0	1	0	0	0	1
<b>Filter Media</b>	0	1	0	0	0	1
<b>Filter Media (Mechanical)</b>	0	0	0	0	0	0
<b>Glassware/Labware</b>	2	0	1	2	0	5
<b>Incinerator Ash</b>	0	0	0	0	0	0
<b>Material that will be Incinerated</b>	0	0	0	0	0	0
<b>Mixed Bed Ion-Exchange Media</b>	0	0	0	0	0	0
<b>Non-Compactible Trash</b>	0	1	0	2	0	3
<b>Organic Liquids (excluding oil)</b>	0	0	1	0	0	1
<b>Paint or Plating</b>	0	0	0	0	0	0
<b>Sealed Source/Device</b>	1	1	1	0	0	3
<b>Soil</b>	0	0	0	0	0	0
<b>Other<sup>30</sup></b>	0	1	0	0	1	2

<sup>29</sup> Waste types listed are as defined by the U.S. Nuclear Regulatory Commission (NRC) Uniform Manifest. Generators frequently report storage of several types of waste.

<sup>30</sup> In certain cases, generators reported storage of waste that did not fit into any of the categories listed. Those data are reported here.

**Table 12. Waste in Storage<sup>31</sup> Pending Disposal by County of Origin**

County	Number of Generators Reporting	Number of Generators Storing LLRW <sup>32</sup>	Volume <sup>33</sup> (m <sup>3</sup> )	% of Total	Radioactivity <sup>33</sup> (GBq)	% of Total
Albany	9	3	0.5	0.7	0.1447	*
Allegany	0	0	0.0	0.0	0.0000	0.0
Bronx	6	2	0.3	0.4	0.0729	*
Broome	1	0	0.0	0.0	0.0000	0.0
Cattaraugus	1	1	1.3	1.7	0.0208	*
Cayuga	0	0	0.0	0.0	0.0000	0.0
Chautauqua	0	0	0.0	0.0	0.0000	0.0
Chemung	2	0	0.0	0.0	0.0000	0.0
Chenango	1	0	0.0	0.0	0.0000	0.0
Clinton	0	0	0.0	0.0	0.0000	0.0
Columbia	0	0	0.0	0.0	0.0000	0.0
Cortland	0	0	0.0	0.0	0.0000	0.0
Delaware	0	0	0.0	0.0	0.0000	0.0
Dutchess	8	2	0.6	0.8	0.0537	*
Erie	13	3	21.6	28.7	327.8218	27.8
Essex	0	0	0.0	0.0	0.0000	0.0
Franklin	0	0	0.0	0.0	0.0000	0.0
Fulton	1	0	0.0	0.0	0.0000	0.0
Genesee	2	0	0.0	0.0	0.0000	0.0
Greene	0	0	0.0	0.0	0.0000	0.0
Hamilton	0	0	0.0	0.0	0.0000	0.0
Herkimer	1	0	0.0	0.0	0.0000	0.0
Jefferson	4	0	0.0	0.0	0.0000	0.0
Kings	2	1	*	*	0.0074	*
Lewis	0	0	0.0	0.0	0.0000	0.0
Livingston	2	1	0.2	0.3	0.0009	*
Madison	0	0	0.0	0.0	0.0000	0.0
Monroe	8	1	1.0	1.3	0.0185	*
Montgomery	1	0	0.0	0.0	0.0000	0.0
Nassau	22	2	0.9	1.2	0.1110	*
New York	18	3	5.8	7.7	0.3911	*
Niagara	3	1	0.8	1.1	0.0026	*
Oneida	1	0	0.0	0.0	0.0000	0.0
Onondaga	15	1	*	*	2.7750	0.2
Ontario	1	0	0.0	0.0	0.0000	0.0



**Table 12. continued**

County	Number of Generators Reporting	Number of Generators Storing LLRW <sup>32</sup>	Volume <sup>33</sup> (m <sup>3</sup> )	% of Total	Radioactivity <sup>33</sup> (GBq)	% of Total
Orange	4	0	0.0	0.0	0.0000	0.0
Orleans	0	0	0.0	0.0	0.0000	0.0
Oswego	4	0	0.0	0.0	0.0000	0.0
Otsego	3	0	0.0	0.0	0.0000	0.0
Putnam	2	0	0.0	0.0	0.0000	0.0
Queens	6	2	3.2	4.2	181.3451	15.3
Rensselaer	3	1	0.8	1.1	2.3941	0.2
Richmond	4	0	0.0	0.0	0.0000	0.0
Rockland	2	0	0.0	0.0	0.0000	0.0
St. Lawrence	1	0	0.0	0.0	0.0000	0.0
Saratoga	2	0	0.0	0.0	0.0000	0.0
Schenectady	2	0	0.0	0.0	0.0000	0.0
Schoharie	0	0	0.0	0.0	0.0000	0.0
Schuyler	0	0	0.0	0.0	0.0000	0.0
Seneca	0	0	0.0	0.0	0.0000	0.0
Steuben	0	0	0.0	0.0	0.0000	0.0
Suffolk	19	2	1.0	1.3	0.3126	*
Sullivan	1	0	0.0	0.0	0.0000	0.0
Tioga	0	0	0.0	0.0	0.0000	0.0
Tompkins	3	0	0.0	0.0	0.0000	0.0
Ulster	2	0	0.0	0.0	0.0000	0.0
Warren	1	0	0.0	0.0	0.0000	0.0
Washington	0	0	0.0	0.0	0.0000	0.0
Wayne	2	0	0.0	0.0	0.0000	0.0
Westchester	15	3	37.2	49.5	665.6123	56.4
Wyoming	1	0	0.0	0.0	0.0000	0.0
Yates	0	0	0.0	0.0	0.0000	0.0
<b>Totals</b>	<b>199</b>	<b>29</b>	<b>75.2</b> <b>(2,655 ft<sup>3</sup>)</b>		<b>1,181.0843</b> <b>(32 curies)</b>	

<sup>31</sup> Includes LLRW in storage at generator sites or an approved off-site location pending transfer to a licensed LLRW facility, as of December 31, 2019. Does not include LLRW held in storage for decay.

<sup>32</sup> Refers to the number of generators who reported LLRW in storage pending disposal as of December 31, 2019.

<sup>33</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.

\* Less than 0.1 cubic meter, or 0.1%, or 0.0001 GBq.

**Table 13. Radionuclide Content of Waste<sup>34</sup> in Storage Pending Disposal<sup>35</sup> (MBq)**

Radionuclide	Half-Life <sup>36</sup>	Academic	Government	Industrial	Medical	Nuclear Power Plants	Total
Am-241	432.7 y		0.185	255.481		110.000	3.7 E2
Ba-133	10.5 y	0.011					1.1 E-2
C-14	5.7 E3 y	878.575	0.343		57.000	25,100.000	2.6 E4
Ce-144	284.6 d					52.800	5.3 E1
Cm-243	29.1 y					8.190	8.2 E0
Co-56	77.3 d				6.059		6.1 E0
Co-57	271.8 d				2.100		2.1 E0
Co-58	70.9 d				14.462		1.4 E1
Co-60	5.3 y	0.004			0.204	17,700.000	1.8 E4
Ct-51	27.7 d				0.009		9.0 E-3
Cs-137	30.1 y	123,584.625	0.751			150,000.000	2.7 E5
Cu-67	2.6 d				1.000		1.0 E0
Fe-55	2.7 y				10.000		1.0 E1
Ga-68	67.6 m				0.036		3.6 E-2
H-3	12.3 y	2,591.819	48.969	181,348.840	375.060	261.000	1.8 E5
I-125	59.4 d				126.500		1.3 E2
I-129	1.6 E7 y		3.480				3.5 E0
Mn-54	312.1 d	3.700			1.105		4.8 E0
Na-22	2.6 y	20.000			0.207		2.0 E1
Nb-94	2.0 E4 y					24.400	2.4 E1
Ni-59	7.6 E4 y					2,890.000	2.9 E3
Ni-63	101 y	1,462.240		328,075.011		342,000.000	6.7 E5
P-32	14.3 d	1.388					1.4 E0
Po-210	138.4 d y			118.785			1.2 E2
Pu-238	87.7 y					40.000	4.0 E1
Pu-239	2.4 E4 y					53.000	5.3 E1
Pu-241	14.4 y					678.000	6.8 E2
Ra-226	1.6 E3 y		0.370	2.600			3.0 E0

**Table 13. continued**

Radionuclide	Half-Life <sup>36</sup>	Academic	Government	Industrial	Medical	Nuclear Power Plants	Total
Ra-228	5.8 y		0.037				3.7 E-2
S-35	87.2 d	0.353			37.000		3.7 E1
Sr-89	50.5 d					65.800	6.6 E1
Sr-90	28.8 y		0.743			3,030.000	3.0 E3
Tc-99m	6.0 h		0.005		45.000		4.5 E1
Th-230	7.5 E4 y		0.740	0.544			1.3 E0
Th-232	1.4 E10 y	0.119		0.381			5.0 E-1
U-238	4.5 E9 y	7.000	0.185	0.381			7.6 E0
Zn-65	243.8 d				0.840		8.4 E-1
Others <sup>37</sup>	---	---	---	---	---	---	---
<b>Total</b>	<b>Total</b>	<b>128,549.834</b>	<b>55.808</b>	<b>509,802.023</b>	<b>676.582</b>	<b>542,013.190</b>	<b>1.2 E6</b>

<sup>34</sup> Some generator facilities have reported radionuclides with half-lives of less than 90 days in LLRW stored. In the majority of these cases, the shorter-lived radionuclides reported cannot be separated readily from longer-lived radionuclides in the waste. The sum of individual radionuclide radioactivities will frequently not match the overall radioactivity totals reported for waste stored due to rounding and other approximation techniques. Every effort is made to identify and resolve significant discrepancies with the affected generators.

<sup>35</sup> To obtain radioactivity in curies, divide the number of megabecquerels (MBq) by 37,000.

<sup>36</sup> Source: Chart of the Nuclides, General Electric Company under the direction of Naval Reactors, U.S. DOE; 16th edition, revised to 2002. NB: y=years, m=months, d=days, h=hours.

<sup>37</sup> In certain cases, LLRW generators are permitted by manifest to report a single activity for a group of radionuclides without assigning a value to each; those data are reported here.

**Table 14. Waste Reported in Storage for Decay<sup>38</sup> by Generator Type**

<b>Generator Type</b>	<b>Number of Generators Reporting</b>	<b>Number of Generators Reporting Storage for Decay<sup>39</sup></b>	<b>Number of Generators Reporting Only Storage for Decay</b>	<b>Estimated Maximum Volume in Storage for Decay at Any Time<sup>40</sup> (m<sup>3</sup>)</b>
<b>Medical</b>	149	144	122	660
<b>Industrial</b>	11	2	0	2
<b>Academic</b>	27	16	1	161
<b>Government</b>	6	1	0	3
<b>Nuclear Power Plant</b>	6	0	0	0
<b>Total</b>	<b>199</b>	<b>163</b>	<b>123</b>	<b>826 (29,166 ft<sup>3</sup>)</b>

<sup>38</sup> Storage for decay means holding the LLRW until the level of radioactivity has diminished to the point where it can be disposed of as non-radioactive waste. Normally, such LLRW is held for 10 half-lives, or until the radioactivity is at a level that is undetectable above background radiation. Typical radionuclides held for decay, with their respective half-lives, include Iodine-123 (13.1 hours), Iodine-125 (59.7 days), Iodine-131 (8.0 days), Technetium-99m (6.0 hours), Phosphorous-32 (14.3 days), Gallium-67 (3.3 days), and Sulfur-35 (89.9 days).

<sup>39</sup> Some generators that store for decay also may have transferred other LLRW to one of the licensed LLRW disposal facilities or may be storing LLRW pending disposal.

<sup>40</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31.

## 4 Historic Data and Projections for Low-Level Radioactive Waste Generation in New York State

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This section provides historic data on the volume and radioactivity of LLRW shipped for disposal, based on generator data reported to NYSERDA for years 2010 through 2019.

This section also provides a summary, based on information supplied in the 2019 generator reports, of generator projections of the volume and radioactivity of LLRW that require disposal in a licensed LLRW facility for the years 2020 through 2024.

Volume projections are rounded to the nearest tenth of a cubic meter, and radioactivity projections to the nearest GBq.

**Table 15. Historic Overview of Waste Disposal by Volume<sup>41, 42</sup> (in m<sup>3</sup>)**

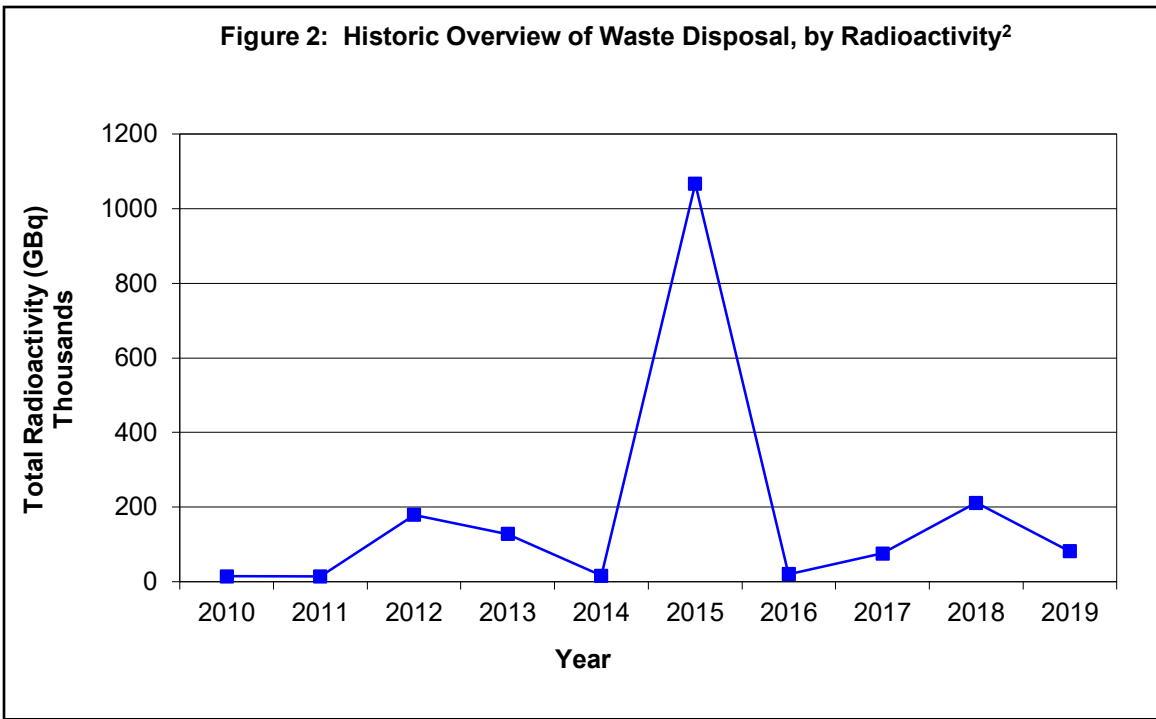
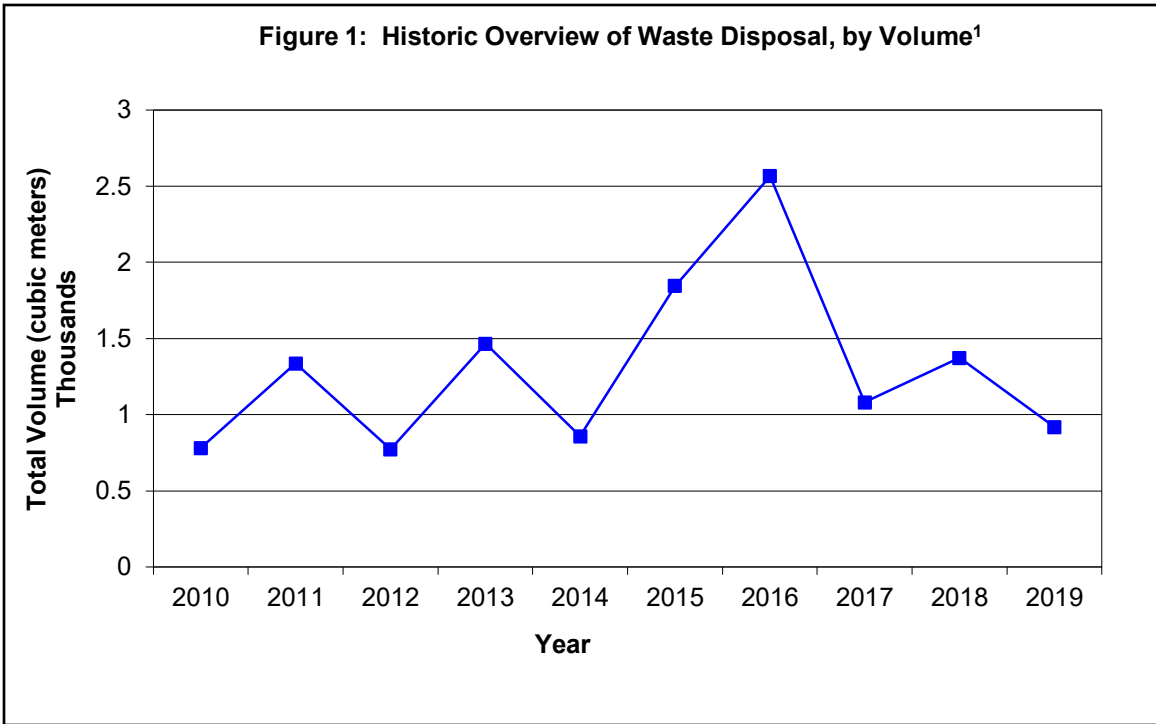
Generator Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Nonpower Plant</b>	184	98	60	46	40	380	79	15	20	51
<b>Nuclear Power Plant</b>	596	1,239	713	1,420	818	1,464	2,487	1,065	1,353	868
<b>Total</b>	<b>780</b>	<b>1,337</b>	<b>773</b>	<b>1,466</b>	<b>858</b>	<b>1,844</b>	<b>2,566</b>	<b>1,080</b>	<b>1,373</b>	<b>919</b>

**Table 16. Historic overview of Waste Disposal by Radioactivity<sup>41, 42</sup> (in GBq)**

Generator Type	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b>Nonpower Plant</b>	621	1,064	196	33	524	41	126	34	974	315
<b>Nuclear Power Plant</b>	13,786	13,205	178,962	128,112	15,533	1,066,628	20,432	75,602	210,454	81,602
<b>Total</b>	<b>14,407</b>	<b>14,269</b>	<b>179,158</b>	<b>128,145</b>	<b>16,057</b>	<b>1,066,669</b>	<b>20,558</b>	<b>75,636</b>	<b>211,428</b>	<b>81,917</b>

<sup>41</sup> Data are based on reports that must be filed annually with NYSERDA.

<sup>42</sup> To obtain volume in cubic feet, multiply the number of cubic meters by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.



<sup>43</sup> In general, the radioactive content of the LLRW disposed continues to be a function of refueling and maintenance activities at New York State's six nuclear power plants, and shows little or no correlation to overall volume. The increase in disposal in 2015 and 2016 can be attributed to three separate disposal actions; decommissioning of a university research reactor and disposal of both irradiated hardware and a large volume of resin from one of the nuclear power plants.

**Table 17. Generators' Five-Year Projections of Waste by Volume (m<sup>3</sup>)<sup>44, 45</sup>**

Generator Type	2020	2021	2022	2023	2024
Medical	26.5	65.5	66.4	28.4	27.5
Industrial	16.5	18.5	17.9	17.3	16.5
Academic	16.4	27.0	26.3	16.4	17.3
Government	0.5	0.7	0.5	0.5	0.5
<b>Total Nonpower Plant</b>	<b>59.9</b>	<b>111.7</b>	<b>111.1</b>	<b>62.6</b>	<b>61.8</b>
<b>Nuclear Power Plant</b>	<b>1,307.0</b>	<b>1,307.0</b>	<b>1,307.0</b>	<b>1,307.0</b>	<b>1,307.0</b>
<b>Total</b>	<b>1,366.9</b>	<b>1,418.7</b>	<b>1,418.1</b>	<b>1,369.6</b>	<b>1,368.8</b>

**Table 18. Generators' Five-Year Projections of Waste<sup>44, 45</sup> by Radioactivity (GBq)**

Generator Type	2020	2021	2022	2023	2024
Medical	30.4	42.0	19.8	20.0	22.3
Industrial	1,046.2	1,045.1	1,045.1	1,045.0	1,045.0
Academic	18.3	6.8	13.4	3.4	13.4
Government	0.1	0.2	0.2	0.2	0.2
<b>Total Nonpower Plant</b>	<b>1,095.0</b>	<b>1,094.1</b>	<b>1,078.5</b>	<b>1,068.6</b>	<b>1,080.9</b>
<b>Nuclear Power Plant</b>	<b>65,790.0</b>	<b>65,790.0</b>	<b>65,790.0</b>	<b>65,790.0</b>	<b>65,790.0</b>
<b>Total</b>	<b>66,885.0</b>	<b>66,884.1</b>	<b>66,868.5</b>	<b>66,858.6</b>	<b>66,870.9</b>

<sup>44</sup> Refers to all classes of LLRW projected by generators to require disposal in a licensed LLRW facility.

<sup>45</sup> To obtain volume in cubic feet (ft<sup>3</sup>), multiply the number of cubic meters (m<sup>3</sup>) by 35.31. To obtain radioactivity in curies, divide the number of gigabecquerels (GBq) by 37.



# Appendix A: Conversions for Units

The metric system is the standard set of measurement units used in science and technology today. Metric or SI system (Système International d'Unités) units have been incorporated into the U.S. Nuclear Regulatory Commission's Uniform Waste Manifest.

Volume is presented in cubic meters and radioactivity is presented in gigabecquerels (GBq) and megabecquerels (MBq). These units have been adopted for this report to be consistent with the uniform national LLRW manifest requirements. Some conversions for SI units to the previously used units of cubic feet and curies are provided in the following tables.

Conversions for Units				
Measurement	SI Unit	Previously Used Unit	Value of Conventional Unit in SI Units	Conversional Factors
Radioactivity	Gigabecquerel (GBq) Megabecquerel (MBq)	Curie (Ci) milliCurie (mCi)	1 Ci = 37 GBq 1 Ci = 37,000 MBq	$Ci \times 37 = GBq$ $Ci \times 37,000 = MBq$ $GBq / 37 = Ci$ $MBq / 37,000 = Ci$
Volume	cubic meters (m <sup>3</sup> )	cubic feet (ft <sup>3</sup> )	1 ft <sup>3</sup> = 0.028 m <sup>3</sup>	$ft^3 \times 0.028 = m^3$ $m^3 \times 35.31 = ft^3$

Radioactivity Conversions		
mCi	MBq	GBq
500	18,500	18.500
200	7,400	7.400
100	3,700	3.700
50	1,850	1.850
20	740	0.740
10	370	0.370
5	185	0.185
2	74	0.074
1	37	0.037

Volume Conversions	
ft <sup>3</sup>	m <sup>3</sup>
11.9 (89 gallon drum)	0.33
11.1 (83 gallon drum)	0.31
7.5 (55 gallon drum)	0.21
4.01 (30 gallon drum)	0.11
0.67 (5 gallon pail)	0.019

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