Ohio Department of Health

Bureau of Radiation Protection

Annual Low-level Radioactive Waste Management Report for 2007

The Ohio Department of Health (ODH) Bureau of Radiation Protection (BRP) is releasing this report titled "Annual Low-level Radioactive Waste Management Report for 2007." The report is designed to keep ODH management informed of low-level radioactive waste in the State of Ohio. The final report is designed and intended for distribution to interested members of the public. Copies of this report may be obtained from the ODH site at http://www.odh.ohio.gov or by contacting ODH, BRP at 614-644-2727.

Ohio Department of Health

Bureau of Radiation Protection

Annual Low-level Radioactive Waste Management Report

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Introduction

The Ohio Department of Health (ODH) Bureau of Radiation Protection (BRP) collects low-level waste generation information from both Ohio and the U.S. Nuclear Regulatory Commission (NRC) licensees in accordance with rule 3701:1-54-02 of the Ohio Administrative Code (OAC). The purpose of this rule is to provide ODH with information relating to the amount of low-level radioactive waste generated (LLRW), treated, stored and/or disposed of by generators within the state.

This report presents a summary of information on the generation and management of LLRW in Ohio during 2007. The definition of LLRW does not include naturally occurring or accelerator-produced radioactive material (NARM) waste. This information is compiled from the annual reports submitted by the LLRW generators to ODH.

Ohio's responsibility as Host State for the Midwest Interstate Low-level Waste Compact was terminated by the Compact Commission in 1997. The compact is no longer involved in siting its own repository.

Radioactive waste generators use the Barnwell, S.C., or EnergySolutions (formerly Envirocare) of Utah disposal facilities for land disposal of radioactive waste. The Barnwell facility has decreased the disposal volume available for out-of-compact radioactive waste generators, which includes Ohio generators. As indicated by the data, land disposal volumes are being shifted to the EnergySolutions facility for the Class A LLRW they accept.

The Ohio Department of Health, Bureau of Radiation Protection

ODH is authorized by Ohio Revised Code (ORC) 3748 to be the radiation control agency for the state. The BRP performs the radiation control functions in behalf of the director of ODH.

Ohio became an agreement state with the NRC for the regulation of byproduct, source and special nuclear materials effective Aug. 31, 1999. Being an agreement state means the NRC has relinquished control and regulation of certain byproduct, source and special nuclear materials within Ohio to ODH.

The director of ODH, through the BRP, collects and analyzes information on LLRW generators within Ohio. These activities are performed in response to the responsibilities given to the states in the Low Level Radioactive Waste Policy Act (LLRWPA) (1980) as amended in 1985 and codified in Title 42 Section 2021 of the United States Code (USC). The reports submitted by waste generators provide information on the management, storage, transportation and disposal of radioactive wastes. Fees are collected from the LLRW generators to help fund this activity.

After Ohio became a member of the Midwest Compact, Ohio rules promulgated in OAC Chapter 3701-77 (effective Dec. 23, 1987) required annual reporting of LLRW generated in Ohio to the director of ODH. In the process of becoming an agreement state, the rules were inadvertently rescinded in 1997. In February 1999, the rules were reinstated under OAC Chapter 3701:1-54. The reporting requirements under the old 3701-77-02 and current 3701:1-54-02 rules were the same; the principal rule differences are in the fee structure associated with the waste generated and an added reporting exemption.

The reporting requirements under the prior OAC 3701:1-54-02 rules have been revised again effective reporting year 2007. Under the current reporting rules, **LLRW reporting exemptions have expanded** to include all LLRW generated and disposed of in accordance with paragraphs (D) to (G) of OAC 3701:1-38-19 (Waste Disposal). Those wastes include:

1.) Licensed materials discharged into sanitary sewerage,

2.) Licensed material held for decay-in-storage (DIS),

3.) License material disposed by incineration (at approved concentration limits), and

4.) Direct disposal of LLRW containing Carbon-14 and Hydrogen-3 (Tritium, at approved concentration limits).

As a consequence of these expanded reporting exemptions, LLRW generator volumes and activities reported for 2007 and in the future **should be less**.

Low- level Radioactive Waste

LLRW is defined in rule 3701:1-38-01 (88) of the OAC. For the purpose of this report, the definition of LLRW does not include NARM, transuranic waste, high-level radioactive waste, DOE- generated or uranium mining and milling waste. LLRW is waste containing radioactive material that meets the definition contained in OAC rule 3701:1-38-01 (88). OAC rule 3701:1-38-01 (88) defines LLRW as follows:

"Low-level radioactive waste" or "LLRW", also "low-level waste," or "LLRW" means radioactive waste which is not high-level radioactive waste, spent nuclear fuel, NARM, or byproduct material as defined in section 11 E (2) of the Atomic Energy Act of 1954, as amended, but is radioactive material that the U.S. nuclear regulatory commission classifies as low-level waste.

LLRW includes a variety of materials that have a wide range of levels of radioactivity. LLRW includes items contaminated with radioactive material, for example protective clothing, paper towels and laboratory equipment. Included are some highly radioactive items, such as sealed sources, materials used to purify coolant in nuclear power plants and from equipment associated with nuclear reactors. LLRW is generated in the operation and maintenance of nuclear power plants as well as hospitals, universities, private research firms, industrial facilities and the military.

The classification system for LLRW, defined in OAC rule 3701:1-54-10 (similar to section 10 CFR 61.55), is designed to take into account the potential hazards of LLRW. The system is based on the concentration of the particular radionuclides in the waste and their half-life and is part of an overall regulatory system designed to control the potential human exposure to disposed radioactive waste. The classes of radioactive waste are:

Class A waste, generally consisting of short-lived radionuclides. (Less than 30 years) but also including low concentrations of some long-lived radionuclides. Disposed Class A waste must be isolated for 100 years.

Class B waste, including waste with higher concentrations of short-lived radionuclides than Class A waste and concentrations of long-lived radionuclides similar to Class A waste. Class B waste must be in structurally stable physical form for disposal or in a structurally stable container that will last for 300 years.

Class C waste, including waste with the highest concentrations of short-lived and long-lived radionuclides that states are responsible for managing. Disposal units for Class C LLRW must have barriers capable of preventing people in future years from accidentally encountering the waste for at least 500 years.

As previously noted, federal law makes each state responsible for providing disposal capacity for LLRW generated in the state. These federal laws; however, do not make the states responsible for all LLRW generated within their borders. The federal government, specifically the DOE, is responsible for LLRW from the following sources and types:

LLRW owned or generated by the DOE.

LLRW owned or generated by the U.S. Navy as the result of decommissioning Navy vessels.

LLRW owned or generated by the federal government as the result of any research, development, testing or production of nuclear weapons.

The primary source of "greater than Class C waste" is from the decommissioning of nuclear power plants and high-activity sealed sources. This class waste is generally not suited for shallow-land burial.

Additional forms of radioactive waste that require regulatory management and oversight are: "Mixed Waste," which satisfies the definition of both LLRW waste and hazardous waste in federal law.

NARM and technologically enhanced, naturally occurring radioactive materials (TENORM), which is a subset of NARM. While not considered by definition as LLRW, these materials require disposal in a controlled manner due to the radiation hazards that exist with this waste.

The federal LLRWPA, ORC 3748 and Ohio rules do not address the collection of information on the activity and volume of NARM waste produced, although it is regulated to the same degree as LLRW. NARM waste is typically generated from medical, consumer and industrial sources. TENORM waste is typically generated as a byproduct from industrial processes and nonindustrial consumers, such as pipe scale and water treatment sludges.

LLRW Generation and Management

Inventory of generators

An LLRW generator report form is sent annually to all Ohio licensees and NRC licensees within Ohio. The inventory of generators is based on analysis of the 2007 annual generator reports that were completed and returned to the BRP. The BRP received 543 responses from licensees, of which 91 generated reportable waste. Only those licensees that generated, continued to store or disposed of LLRW in 2007 were required to submit a report. The remainder were either exempt or did not generate any LLRW.

ODH has provided seven separate classifications for generators instead of the standard five mentioned in national waste report statistics. The additional classifications are Uranium Enrichment and Academic/Medical. Uranium Enrichment was added because

United States Enrichment Corporation (USEC) is regulated by the NRC as a private enterprise and has a unique waste stream. The blend of Academic/Medical was added because the facilities under this category are both medical institutions and universities, and as such, produce the activity typical of medical institutions and the volume typical of academic/research institutions.

The waste generator descriptions are:

Utilities – Public or private utilities that provide basic services within the state borders. The volume and activity in this category is almost exclusively from nuclear power plants. Other utilities use licensed radioactive material in the form of sealed sources for process measurements, typically for level and fill measurements in coal-fired utilities.

Medical Facilities – Hospitals, physicians and clinics licensed to use radioactive materials as part of their service.

Academic and Research Facilities – Licensed colleges, universities and research facilities within the state borders, including research reactors that use radioactive materials in the course of teaching or research.

Academic/Medical – A joint medical facility within an academic and research institution where the combined facility generates waste with activities and volumes characteristic of each.

Government – NRC-licensed and state-licensed government agencies within Ohio.

Industrial – NRC-licensed and Ohio-licensed sources within the State of Ohio. These licenses may include sealed sources and radioactive devices as well as commercial nuclear pharmacies or other service providers licensed by the NRC or Ohio to conduct radioactive material distribution activities that generate LLRW.

Uranium Enrichment – NRC-regulated activities for the processing of uranium and uranium ores for use as nuclear reactor fuel.

The assignment of generator classification is based on the generator's self-identification. Commercial entities submitted under other classifications were entered under the "industrial" classification.

Volume and Activity of LLRW generated in 2007

The LLRW generator report form sent to licensees (copy in appendix) requested information regarding the volume and activity of the LLRW generated. Additional information regarding the amount of LLRW stored at the end of the calendar year, the amount of LLRW shipped for disposal and the treatment of LLRW during the calendar year were also requested.

The results of the responses were entered into a computer database. The computer program handled MBq and Ci activity conversions. Due to the wide range of data values for activity and volume, the data were manipulated in scientific notation with three significant digits. The implicit error introduced by using data in this format ranges from 0.1 percent to a 1 percent error.

For general readability of the report, the volume terms were reported in cubic feet number formats and radionuclide activities are converted back to Curie units. Therefore, some rounding errors may be found.

In accordance with OAC rule 3701:1-54-02, certain generators of LLRW were exempted from having to submit an LLRW generator report. A reporting exemption was granted to users of byproduct radioactive material provided the only byproduct materials used had a half-life of one day or less. This exemption provides regulatory relief from filing by small clinics and physicians using short half-life radioactive materials for medical diagnosis and imaging even though they did generate LLRW. Other licensees who generate LLRW may also benefit from the additional reporting exemptions referred to previously on page 6 of this report if they qualify.

Generators of NARM waste are not designated as LLRW generators because NARM is not included in the definition of LLRW. Examples of these radionuclides include, but are not limited to, Germanium/Gallium-68, Cobalt-57 and 58, Thallium-201, Sodium-22, Iodine-123, Radium-226 and Indium-111. Often the distinction must be traced to a manufacturer, as numerous radionuclides may also be produced in a reactor.

The volume and activity of the waste generated by waste class is listed in Table 2 "Waste Generated by Waste Class." Class A waste constitutes the majority of the volume of waste generated. Class C constitutes most of the activity, and for 2007 more than 90% of this originates from the nuclear utilities.

Table 1 – Waste Generator Classification

Waste Generator Classification	Activity in MBq (Ci)	% of total activity	Volume generated In ft^3	% of total volume generated
Academic	11,102,938.11 (300.08)	0.75	288.59	0.29
Academic/medical	3,939.02 (0.1)	<0.01	549.23	0.55
Government office	111,001.53 (3)	<0.01	164.32	0.17
Industrial	1,798,468.67 (48.6)	0.12	6,320.6	6.38
Medical	23,049.49 (3.15)	<0.01	301.63	0.3
Uranium enrichment	116.624 (0.3)	<0.01	9,442	9.54
Utility	1,474,825,599.7 (39,860.15)	99.12	81,957.95	82.77
TOTAL	1,487,981,620.6 (40,215.72)	---	99,024.32	-

Table 2 – Waste Generated by Waste Class

	Activity in MBq (Ci)	% of Activity	Volume In ft^3	% of volume
A	25,787,455.52 (697)	1.73	98,348.85	96.07
B	4,036,700 (109.1)	0.27	171.96	0.71
C	1,458,157,465.05 (39,409.9)	98	503.51	3.22
Total	1,487,981,620.5 (40,215.72)	___	99,024.32	___

Trends of Generated LLRW

In 1998, an LLRW generator's report to report 1997 waste generation was not sent to generators. Factors included: The Midwest Compact Commission discontinuance of LLRW disposal siting in Ohio for which Ohio was to be host state; the reassignment of LLRW staff; and the replacement of LLRW rules as described earlier.

Table 3 – Activity Trend (in Ci) of Waste Generated

Classification/Year	1995	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Academic	2.2	2.97	1.81	1.62	1.77	1.18	1.14	30.6	11.9	12.9	16.9	300.08
Academic/Medical	-	-	7.0	7.38	1.76	2.39	2.08	1.39	5.6	3.3	3.6	0.1
Government Office	0.39	-	0.36	0.07	0.15	0.12	0.03	-	0.01	0.01	0.73	300
Industrial	15.3	3.24	31.9	61.4	3,644	1,122	1,611	2,840	1,943.8	18,733	5,068	48.6
Medical	25.6	22.4	976	1,103	1,650	972	667	1,831	13,060	2,425	1,467	0.62
Uranium Enrichment	-	-	0.59	0.47	0.45	0.19	0.16	1.16	1.96	1.5	0.3	3.15
Utility	551	1,540	132	368	442	791	976	396	1,933	94.8	2,692	39,860.15
TOTAL	595	1,569	1,150	1,153	5,740	2,888	3,258	5,100	16,956	21,272	9,249.9	40,215.72

Table 4 - Volume Trend (in ft^3) of Waste Generated

Class/Year	1995	1996	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Academic	2,682	1,371	3,340	859	1,893	1,732	2,153	2,017	2,096	2,093	2,705	288.59
Acad/Medi - cal	-	-	4,200	3,897	3,189	1,885	1,216	1,319	1,413	1,558	1,159	549.23
Govern Office	59	10	76	91	24	134	31	5	247	29	8	164.32
Industrial	11,055	2,792	7,640	35,308	510,664	21,311	7,310	23,291	87,035	23,937	23,344	6,320.6
Medical	26,082	22,351	25,300	80,921	8,853	8,638	8,524	21,393	22,116	7,791	8,881	301.63
Uranium Enrichment	-	-	62,400	41,521	42,388	18,013	15,400	6,001	21,099	19,074	20,338	9,442
Utility	11,244	14,641	17,000	30,140	29,259	73,255	66,581	86,793	19,599	51,582	82,165	81,958
TOTAL	51,122	41,165	120,000	192,736	596,271	124,969	101,216	140,820	121,544	106,065	138,601	99,024

The volume of LLRW produced by USEC has declined significantly since 2000 as the Ohio facility has been on standby mode. It is expected to return to full operation in the future, thus waste volumes will increase. In addition, a Depleted Uranium Hexafluoride (DF6) facility being constructed is scheduled to commence conversion of large quantities of waste DF6. This will also generate additional waste streams.

Changes in the volume generated or shipped do not translate into a proportional change in the volume disposed in a licensed land disposal facility. One reason is some generators are using commercial service providers to segregate and decontaminate radioactive waste prior to disposal, therefore reducing the volume disposed. Several kinds of waste, especially in the medical arena, are held for DIS on site prior to disposal, which is a common form of waste treatment to dispose of or eliminate the radioactive component of the waste.

Treatment of LLRW

LLRW may be treated to reduce the waste volume, radionuclide activity or make the waste safer. As defined in rule 3701:1-54-01 of the OAC, "Treatment means any method, technique, or process, including storage for decay, that changes the physical, chemical, or biological characteristics of any low level waste in order to render the waste safer for transport or management, amenable to recovery, convertible to another usable material, or reducible in volume."

DIS is the most commonly used method for treating LLRW. To use DIS, the radioactive waste is held in a segregated container from other waste and stored for 10 half-lives or until the radioactivity from the waste is no longer distinguishable from background, whichever is longer. After the radioactive material has decayed, the remaining waste can be disposed of appropriately as biohazardous, sharps, pathological, chemical or normal trash.

LLRW is frequently processed off site to reduce the volume prior to disposal and/or achieve a more stable waste form for disposal. Waste volume reduction can be accomplished in a number of ways including:

- Decontamination.
- Compaction.
- Supercompaction.
- Incineration.
- Commercial DIS.
- Thermal reduction.

Commercial LLRW processors used by Ohio generators are located outside of Ohio. The vast majority of processors disposed of the processed waste at a licensed facility on behalf of the generator in lieu of returning the processed waste.

For nuclear power plants, there has been a shift from treating the waste on site, to having a commercial firm segregate the waste, then treat the remaining waste by incineration or other means. The processor, not the generator, is primarily responsible for the final volume reduction.

Use of Decay-in-storage (DIS)

Medical and academic facilities are avid users of DIS because it is simple to implement and does not have any direct costs. Indirect costs include the use of secured space and personnel time for logging, tracking and surveying waste.

Unless identified otherwise, the volume and activities listed are for the waste generated not the volume and activity for the LLRW after treatment.

The "final volume" is the generator-identified volume after treatment, either by the generator or a commercial processor. The radioactive waste generation fee can be reduced by declaring the reduced volume after treatment. The final volume and activity after treatment is in Table 9. This statistic is the volume and activity disposed at the two LLRW land disposal facilities.

The waste type "Dry Solid" may combine several subcategories of solid waste into a single category. Examples of subcategories combined in the Dry Solid waste type include incinerator ash, sludges, filter media, contaminated equipment, stock vials and other solid waste containing trace quantities of free-standing liquids. Resins/beads are separated out from the "Dry Solid" waste stream as they constitute the majority proportion of the activity. Most of this waste stream results from the filtration of water in the nuclear power industry.

Table 5 – Waste Activity and Volume Generated by Waste Type

Waste Type	activity MBq (Ci)	% of activity	Volume in ft^3	% of volume
Animal Carcass	2,979.9 (0.08)	<0.01	26.6	0.03
Aqueous Liquid	7,211.98 (0.19)	<0.01	117.82	0.12
Biohazard/ Pathological	71.57 (0.0019)	<0.01	23.2	0.02
Debris (HV-LLRW)	1,656,272.9 (44.6)	0.11	2,169.5	2.19
Dry Solid	1,474,143,593.7 (39,841.7)	99.07	93,750.86	94.69
Nat U/Th	0.48 (13µCi)	<0.01	-	-
Liquid Mixed Waste	81,429.06 (2.2)	0.01	101.48	0.1
Resin/Beads (ion exchange)	11,951,000 (323)	0.8	2,558	2.58
Scintillation Vials	711.91 (0.019)	<0.01	193.35	0.2
Scintillation Fluid-bulk	111,003.52 (3)	0.01	31.40	0.03
Sealed Sources	8,503.07 (0.23)	< 0.01	4.72	<0.01
Soil/Debris < 50 ft^3	4.07 (110µCi)	< 0.01	22.5	0.02
Total	1,487,981,620.6 (40,215.72)	-	99,024.32	-

LLRW Shipments

The generalized flow of radioactive waste from generation to disposal can be simplified into the following sequence of events. (1) The waste is generated and recognized as a radioactive waste. (2) The radioactive waste is treated on site and packaged for shipment as appropriate for the waste stream. (3) The radioactive waste is shipped to a treatment, storage or disposal facility (TSDF). (4) The waste is treated to reduce volume and activity as appropriate by the TSDF. (5) The remaining radioactive waste is sent by the TSDF back to the generator or a licensed facility for burial on behalf of the generator. For the purposes of the waste generator report, the return of contaminated syringes to a radiopharmacy was not considered either a waste shipment or disposal. Syringes and needles are used to inject patients with short-lived radionuclides. The syringe volumes and activities are incorporated in the nuclear pharmacy waste reports.

A total of 40 licensees reported shipping LLRW waste in 2007.

Table 6 – LLRW Shipments by Waste Class

Waste Class	Activity MBq (Ci)	% of activity	Volume (ft^3)	% of volume
A	208,185,195.35 (5,626.6)	12.44	102,797.75	99.3
B	4,036,700 (109.1)	0.24	171.96	0.17
C	1,461,874,147.9 (39,510.1)	87.32	555.7	0.53
TOTAL	1,674,096,043.2 (45,245.8)	-	103,525.41	-

The waste shipped was also broken down by the disposal destination of the waste.

Table 7 – LLRW Shipments by Disposal Destination

Destination	Activity MBq (Ci)	% of activity	Volume (ft^3)	% of volume
East Chicago	247.04 (0.006)	<0.01	216.5	0.21
Barnwell	1,466,808,318 (39,643.5)	87.62	55,128.35	53.91
DSSI (TN)	65,666.75 (1.77)	<0.01	80.17	0.08
EnergySolutions (UT)	96,130,144.75 (2,598.11)	5.74	47,204.67	45.61
Oak Ridge	88,944.13 (2.4)		158.84	0.16
PCI	359.18 (0.009)		269.5	0.26
Permafix	111,000,000 (3,000.01)	0.07	151.86	0.14
Duratek	1,278.29 (0.034)	<0.01	81	0.08
Clean Harbors	2.75 (7.4E-5)	<0.01	22	0.02
WCS	0.54 (1.4E-5)	<0.01	4.1	<0.01
U.S. Ecology	154.47 (4 mCi)	208.07 0.2		
TOTAL	1,674,096,043.22 (45,245.8)	-	103,525.41	-

Barnwell is an LLRW disposal site in South Carolina that accepts class A, B and C radioactive wastes. It is in the process of phasing out acceptance from outside the Atlantic Compact. Ohio LLRW generators lost access in July 2008.

The EnergySolutions site currently accepts class A radioactive waste. As evidenced by the data in Table 10, this facility is the site of choice for disposal of LLRW, including large volume decommissioning waste.

Table 8 – Total LLRW Shipments by Year

Calendar Year	Activity in MBq (Ci)	Volume in ft^3
1998	5,840,000 (158)	27,518
1999	15,900.000 (430)	92,310
2000	22,021,265 (595)	74,484
2001	30,323,124 (820)	105,899
2002	14,807,530 (400)	69,880
2003	3,005,880.1 (81.24)	62,253
2004	21,868,587.69 (591.04)	36,556
2005	5,233,693.71 (141.45)	59,631
2006	100,141,428 (2,706.5)	135,281
2007	1,674,096,043.22 (45,245.8)	103,525

LLRW Land Disposal

Table 9 is a list of the activity and volume of radioactive waste received from Ohio licensees and disposed at the Barnwell and the EnergySolutions facilities. The data are values reported by the respective land disposal facilities.

Table 9 – Land Disposal – Barnwell Disposal Site Reports

Year	Activity in MBq (Ci)	Volume (ft^3)
1998	3,626,000 (98)	1,544
1999	1,480,000 (40)	1,577
2000	12,617,000 (341)	2,230
2001	5,069,000 (137)	1,358
2002	44,881,000 (1,213)	729.9
2003	11,928,430 (322)	245.9
2004	406,223,000 (10,979)	857
2005	42,388,680 (1,146)	508
2006	92,033,800 (2,487)	573
2007	1,478,719,034 (39,965.4)	1,119.8

Table 10 – Land Disposal - EnergySolutions Utah Site Reports

Year	Activity in MBq (Ci)	Volume (ft^3)
1998	24,383 (0.659)	4,240
1999	-	73,905
2000	72,520 (1.96)	62,091
2001	258,260 (6.98)	48,764
2002	202,760 (5.48)	14,329
2003	96,200 (2.6)	5,005
2004	781,762 (21.13)	215,883
2005	1,011,432 (27.34)	108,7134
2006	10,815,100 (292.3)	103,638
2007	1,184,407 (32.011)	21,127

The volumes and activities of the radioactive waste presented here are what remain after the generated radioactive waste has been treated, segregated and reduced in volume prior to final disposal. There are some lag times between waste generation, to shipment and/or treatment and eventually disposal at a land disposal facility when appropriate.

Due to the closure of Barnwell, the activity and volume of LLRW going to EnergySolutions in Utah will likely increase. Disposal availability may increase in the future if legislative initiatives across the country point to the development of new disposal sites.

LLRW Storage

Currently, few locations in Ohio store LLRW for extended periods. LLRW is stored on site for DIS awaiting treatment options or accumulating for shipment. The NRC, by policy and license conditions, did not allow licensees to store LLRW for extended periods on site, other than DIS, if there were readily available treatment or disposal options. As Ohio is now an NRC agreement state, the current policy and requirements for licensees storing LLRW beyond a five-year period may be found in OAC rule 3701:1-54-03, titled "Assured Isolation Facility."

Medical facilities commonly use DIS or transfer their material back to the pharmaceutical vendor as the preferred method of waste management. The radionuclides in the LLRW held for DIS generally have short half-lives, six hours or less in many cases. These facilities plan to continue to use DIS and thus are able to avoid the reporting and costs associated with other disposal methods.

The following tables provide information on waste storage as of Dec. 31, 2007, placed into storage during and prior to 2007.

Table 11 – LLRW Remaining in Storage by Year Generated

Year Generated	Activity MBq (Ci)	% of total activity	Volume in ft^3	% of total volume
1993	29.6 (0.0008)	<0.01	89.00	0.68
1994	296 (0.008)	<0.01	216	1.64
1995	1.11 (0.00003)	<0.01	4	0.03
1996	185 (0.005)	<0.01	573	4.36
1997	74 (0.002)	<0.01	165	1.26
1998	185 (0.005)	<0.01	516	3.93
1999	740.15 (0.02)	<0.01	1,193	9.08
2000	156,566.9 (4.23)	0.24	2,513	19.14
2001	52,080.46 (1.4)	0.08	536	4.08
2002	797.54 (0.02)	<0.01	1,893.13	14.41
2003	30,549.4 (0.78)	0.05	1,010.6	7.69
2004	29,533.04 (0.8)	0.05	834.78	6.35
2005	26,901.15 (0.72)	0.04	1,735.24	13.21
2006	59,204,725.4 (1,600.12)	99.5	1,848.54	14.06
2007	131.57 (0.0035)	0.04	9.91	0.08
TOTAL	59,502,796.38 (1,608.18)		13,139	

Table 12 breaks down the waste held in storage for more than one year by the waste type. Aqueous waste represented the largest percentage activity.

Table 12 – LLRW Remaining in Storage by Waste Type

Waste Type	Activity MBq (Ci)	% of activity	Volume ft^3	% of volume
Dry solid waste	22,353,972.32 (604.16)	37.57	13,050.11	99.32
Liquid-aqueous	37,000,820.7 (1000.02)	62.18	68.8	0.52
Scintillation fluid /bulk	0.67 (18µCi)	<0.01	2	0.02
Scintillation vials	0.99 (26µCi)	< 0.01	15.7	0.12
Sealed sources/special form	148,000.37 (4)	0.25	2.0	0.02
TOTAL	59,502,796.38 (1,608.18)	-	13,139	-

Appendix

Low-level Radioactive Waste Generator Report Form

For Calendar Year 2007

2007 Low-Level Radioactive Waste Generator Report
Ohio Department of Health – Bureau of Radiation Protection

Licensee Information

Licensee Name _____
Street Address _____
_____
_____
Telephone number (_____) _____ - _____
Federal Tax ID number _____

Organization Classification
[__] Academic
[__] Industrial
[__] Medical
[__] Utility
[__] Government Office
[__] Uranium Enrichment
[__] Academic and Medical

[__] I/We did not generate, possess, or store any low-level radioactive waste in CY 2007.

----------Remainder for Generators Only ----------

Person completing LLRW annual report

Name _____ Title _____
Phone number (_____) _____ - _____

Radiation Safety Officer

Name (printed) _____ Title _____

RSO Signature _____ Date _____

Radioactive Material License Number: _____

Generator Reporting Exemption

[__] This facility is exempt from low level radioactive waste generator reporting requirements under 3701:1-54-02 since this facility exclusively generates and disposes of LLRW in accordance with paragraphs (D) to (G) of 3701:1-38-19 of the Ohio administrative code.

2007 Low-Level Radioactive Waste Generator Report
Ohio Department of Health - Bureau of Radiation Protection
Radioactive Materials License Number: _____

Table 1a - 2007 LLRW Generated and Not Placed in Storage

Complete the following table for the types and amount of waste generated in CY 2007 and not placed into storage. Summarize from your records, and subtotal based on waste class and type, the information requested in the table below.

- In the column "Waste Class," enter the waste classification of A, B, or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste. Examples of generic descriptions are dry solid, aqueous liquid, scintillation vials, biological (animal carcasses), or high volume low level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in 3701:1-54-02.
- Enter the predominant radionuclides contained in each waste class and type in the column labeled "Radionuclide."
- Enter the total radionuclide activity for each waste class and type in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume Generated," enter the volume of waste generated in cubic feet before using waste treatment techniques.
- If the waste was treated, enter the volume of waste after treatment in cubic feet in the column labeled "Volume after Treatment." [Complete information on the processor in table "Generator Certification of Processed Waste" as applicable.]
- Treatment is defined in 3701:1-54-01.
- In the column labeled "Type of Disposal," indicate the disposition of the waste as land burial, vitrification, etc.

[__] Does not apply - no data to report for this table.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume Generated (cu ft)	Volume after treatment (cu ft)	Type of Disposal

Table 1b - 2007 LLRW Generated and Placed into Storage

Complete the following table for the types and amount of waste generated in the CY 2007 and placed into storage. Summarize, from your records, and subtotal, based on the waste class and type, the information requested in the table below.

- In the column "Waste Class," enter the waste classification of A, B, or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste. Examples of generic descriptions include dry solid, aqueous liquid, scintillation vials, biological (animal carcasses), or high volume low level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in 3701:1-54-02.
- Enter the predominant radionuclides for the waste class and type in the column labeled "Radionuclide."
- Enter the total radionuclide activity for the waste class and type in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume Generated," enter the volume in cubic feet of waste generated before treating the waste.
- If the waste was treated, enter the volume of waste (in cubic feet) placed into storage after treatment in the column labeled "Volume After Treatment." [Complete information on the processor in table "Generator Certification of Processed Waste" as applicable.]
- Treatment is defined in 3701:1-54-01.

[__] Does not apply - no data to report for this table.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume generated (cu ft)	Volume after treatment (cu ft)

Pre-2007 LLRW Remaining in Storage

Complete the following table for the types and amounts of LLRW that was placed in storage before January 1, 2007, and continued to be held in storage as of December 31, 2007. Summarize from your records, subtotal based on the waste class and type by year, the information requested in the table below.

- In the column labeled "Year Generated," enter the year that the waste was placed into storage.
- Enter the waste classification of A, B, or C as defined in OAC 3701:1-54-10 in the column labeled "Waste Class."
- Enter the waste type as a description of the physical characteristics of the waste in the column labeled "Waste Type." Examples of the generic descriptions include dry solid, aqueous liquid, scintillation vials, biological (animal carcasses), or high volume low-level radioactive waste (HV-LLRW) from decommissioning or decontamination. HV-LLRW is defined in 3701:1-54-02.
- In the column "Radionuclide," enter the predominant radionuclides remaining in the waste as of December 31, 2007.
- Enter the decay corrected activity of the waste remaining in storage as of December 31, 2007, in the column labeled "Activity." Indicate by check mark the units of activity that are being used.
- In the column "Volume," enter the volume (in cubic feet) of waste held in storage after any treatment techniques were used.

[__] Does not apply - no data to report for this table.

Year Gener-ated	Waste Class	Waste Type	Radionuclide(s)	Activity (12/31) [_] Ci [_] mCi [_] MBq	Volume (cu ft)

2007 Low-Level Radioactive Waste Generator Report
Ohio Department of Health - Bureau of Radiation Protection
Radioactive Materials License Number: _____

LLRW Shipment Information

Identify the types and amount of LLRW shipped in CY 2007, including carrier or broker, shipment dates, and modes of transportation. Provide a summary of the information from your individual waste manifest forms. The summaries may be subtotaled by carrier and destination for a shipment period in lieu of specifying individual dates. For example, a period may be a calendar quarter or a year. Make additional copies of this page if needed.

- In the column "Waste Class," enter the waste classification of A, B, or C as defined in OAC 3701:1-54-10.
- In the column "Waste Type," enter the waste type as a generic description of the physical characteristics of the waste as entered on your waste manifest (ref. OAC 3701:1-38-19 Appendix A, 3701:1-50-05)
- In the column "Radionuclide," enter the predominant radionuclides contained in each waste class and type.
- Enter the total radionuclide activity in the column labeled "Activity" for each waste class and type. Indicate by check mark the units of activity that are being used.
- In the column labeled "Volume," enter the volume of waste transported by the carrier/broker in cubic feet. (Note: there are 35.3 cu ft in a cubic meter.)
- Enter the *final* destination/disposal site (e.g. Energy Solutions). List only one disposal site per table.
- Make as many copies of this page as needed.

[__] Does not apply - no data to report for this table.

Carrier/Broker:_____ Shipment date(s)/period:_____

Final Destination: _____Disposal Site: _____

Mode of Transportation (3701:1-50-05)

[_] public highway [_] air [_] vessel [_] rail

Truck carrier permitted by Ohio PUCO to transport hazardous materials

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume (cu ft)

LLRW General Information

Was any LLRW stored or shipped in CY 2006 that was not reported in last years report?

[_] Yes [_] No

If yes, describe the types and amounts.

_____

_____

Describe the methods used to treat, store, and dispose of LLRW.

_____

_____

_____

_____

_____

_____

Describe actions taken, or planned to be taken, to reduce the LLRW volume or production

_____

_____

_____

_____

_____

_____

Anticipated 2008 LLRW Generation

If the anticipated types and amount of waste to be generated or placed in storage during CY 2008 will be approximately the same as CY 2007, check the box below. Otherwise, complete the table below estimating the type and amount of LLRW to be generated or placed in storage during CY 2008.

[_] Approximately the same as CY 2007.

Waste Class	Waste Type	Radionuclide	Activity [_] Ci [_] mCi [_] MBq	Volume (cu ft)

Generator Certification of Processed Waste

Was any low level radioactive waste sent to a processor for the purpose of treating the low-level radioactive waste, and either returning the waste to the generator or disposing of the waste on behalf of the generator?

[__] Yes [__] No

If yes, complete the following table for low level radioactive waste that was sent out for volume reduction. The date is the date shipped. The volume shipped is the initial volume of the shipment being sent out for volume reduction. Indicate who the processor was and what treatment was used (e.g. compaction, incineration). Indicate for that particular shipment the volume of waste returned or disposed on behalf of the generator. If the waste was returned to the generator, include the date of the return by the processor.

Date	Volume Shipped	Processor	Process Technique	Volume Returned or Disposed	Return Date