2009

Annual Low-Level Radioactive Waste

Program Report

to the

Pennsylvania General Assembly and the

Appalachian Compact Commission

Bureau of Radiation Protection

Commonwealth of Pennsylvania

An Equal Opportunity Employer

MESSAGE FROM THE SECRETARY

In 1980, the U.S. Congress enacted the Low-Level Radioactive Waste Policy Act. It made each state responsible for the disposal of such waste generated within its borders and encouraged states to enter into compacts with each other.

The Pennsylvania General Assembly responded to the federal act by enacting the Appalachian States Low-Level Waste Compact Act of 1985 (Act 1985-120). The Act permits Pennsylvania to establish a regional disposal site for the Appalachian Compact states of Delaware, Maryland, West Virginia, and Pennsylvania. Pennsylvania was selected as the initial host state because it generates the largest amount of the waste within the Appalachian Compact.

Since the Act was passed, the factors that drove the need for such a facility have changed dramatically. In December 1998, the Department of Environmental Protection (DEP) announced the suspension of efforts to site a low-level radioactive waste (LLRW) facility in Pennsylvania. There is currently disposal capacity for Class A LLRW at one out-of-state facility.

While Pennsylvania suspended the siting process, it maintains the ability to restart it should circumstances again change. The work done under the state's voluntary siting and technical screening process would provide a solid foundation for future work if necessary.

To help assure the public that LLRW is disposed of properly, the Pennsylvania DEP's Bureau of Radiation Protection currently collects storage and disposal data from the LLRW generators as well as from the U.S. Department of Energy's (DOE) national LLRW database and the Energy Solutions disposal facility in Clive, Utah. The data is compiled and reported in this, the *Annual Low-Level Radioactive Waste Program Report to the Pennsylvania General Assembly and the Appalachian Compact Commission*. This report contains the LLRW generation data for calendar year 2009.

Sincerely,

Michael L. Krancer
Secretary

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CHAPTER 1

INTRODUCTION

This report is prepared for submission to the Pennsylvania General Assembly and the Appalachian Compact Commission (Commission). Its purpose is to fulfill the statutory requirements contained in Section 901 of the Pennsylvania Low-Level Radioactive Waste (LLRW) Disposal Act 1988-12 and Article 2 (1)(4) of the Act 1985-120.

There are two major differences from this year's report compared to the previous annual reports. First, this report does not contain disposal information for Class B and C wastes from the Appalachian Compact (Compact). This is due to the closure of the Barnwell, South Carolina LLRW disposal facility to generators outside of the Atlantic Compact (Connecticut, New Jersey and South Carolina). However, the Compact is tracking these types of waste and is reporting it as "waste in storage." Appendix B includes a chart containing this information. The other major difference is that the *Annual Low-Level Radioactive Waste Program Report to the General Assembly* and the *Appalachian States Low-Level Radioactive Waste Commission Annual Report* are now combined into one report.

Chapter 2 of this report contains activities of the Commission as well as the host state of Pennsylvania.

Chapter 3 contains a discussion of LLRW quantities generated in Pennsylvania and the Compact, waste minimization and toxicity of LLRW.

Chapter 4 contains the financial statistics and expenditures for Pennsylvania (calendar year 2009) and the Commission (fiscal year 2009-10), and a list of LLRW disposers in the Compact for 2009.

The report also includes information on volume, curie content, waste class, radionuclides and waste toxicity of LLRW generated. The information was obtained from the Energy Solutions facility in Clive, Utah and the Department of Energy's national database contained in the Manifest Information Management System (MIMS).

Appendix B contains pertinent LLRW disposal tables and charts for Pennsylvania and the other member states of the Compact - Delaware, Maryland and West Virginia.

Appendix C provides statistics relating to volume and activity trends of LLRW during 1990 through 2009.

Appendix D includes the independent auditors' report of the Commission's financial accounts for fiscal year 2008-09.

CHAPTER 2

APPALACHIAN STATES COMPACT ACTIVITIES

The Commission was established under a compact entered into by Delaware, Maryland, West Virginia and Pennsylvania. The U.S. Congress consented to the Compact in May 1988. The primary purpose of the Compact is to provide for the regional management and disposal of LLRW as required by the federal Low-Level Radioactive Waste Policy Act of 1980, as amended. Pennsylvania was designated as the initial host state to provide a site for a regional facility because it generates more LLRW than the other Compact members. Other important duties of the host state are to:

- Ensure, consistent with applicable state and federal law, the protection and preservation of public health, safety and environmental quality in the siting, design, development, licensing, operation, closure, decommissioning, and long-term care for the institutional control period of the facility within the state;
- Prohibit the use of any shallow land burial and develop alternative means for treatment, storage and disposal of LLRW;
- Establish requirements in law for financial responsibility. These requirements include purchase and maintenance of adequate insurance by generators, brokers, carriers and regional facility operators and establish a long-term care fund to pay for preventative or corrective measures at the regional facility;
- Ensure that charges for disposal of LLRW at the regional facility are sufficient to fully fund the safe disposal and perpetual care of the regional facility, and that charges are assessed without discrimination based on the state of origin; and
- Ensure and maintain a manifest system that documents all waste-related activities of generators, brokers and carriers, and establish the chain of custody of waste from its initial generation to the end of its hazardous life.

Summary of the Host State Activities for the Calendar Year 2009

The DEP continued to perform the administrative responsibilities and duties of the Commission. The Commission's powers and duties are specified in the Act.

In March 2009, a representative from the DEP attended the LLW Forum meeting in Columbia, South Carolina. The LLW Forum was established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act and to promote the objectives of LLRW regional Compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

In September 2009, a representative from the DEP attended the LLW Forum meeting in Park City, Utah. The meeting included a site tour of the Energy Solutions' LLRW disposal facility in Clive, Utah.

In October 2009, the DEP held the annual meeting of the Low-Level Radioactive Waste Advisory Committee. The primary purpose of the meeting was to: (1) Review and discuss

regional and national issues and developments related to LLRW management and disposal; (2) Review information on LLRW generation and storage within the Compact; and (3) Elect the Committee officers.

In November 2009, the DEP's LLRW Program staff coordinated and attended the annual meeting of the Commission in Harrisburg.

The DEP continued to monitor the generation of LLRW in Pennsylvania. The DEP has significantly reduced the regulated community's administrative LLRW reporting requirements, by now obtaining the appropriate disposal information directly from the national MIMS database.

Summary of Commission's Activities for Fiscal Year 2008-09

In July 2008, the Commission's independent auditor, Greenawalt & Company, P.C., conducted its annual audit of the Commission's financial statements for fiscal year 2008-09. The audit did not identify any instances of non-compliance that are required to be reported under Government Auditing Standards.

In September 2008, representatives from the Commission attended the LLW Forum meeting in Annapolis, MD. This meeting was sponsored by the Compact with assistance from DEP staff.

In November 2008, the Commission held its annual meeting. The primary purpose of this meeting was to: (1) Review the Independent Auditors' Report of Commission's financial statements for fiscal year 2008-09; (2) Consider a proposed revised budget for fiscal year 2008-09 and a proposed budget for fiscal year 2009-2010; (3) Review and discuss national and regional developments related to LLRW management and disposal; (4) Review information on LLRW generation within the Compact; (5) Review the NRC Regulatory Information Summary for Extended Interim Storage of LLRW; (6) Review and discuss reporting requirements for Class B and C wastes in storage; (7) Review host state status for the Compact; (8) Discuss Energy Solutions' proposal to import LLRW from Italy; (9) Provide an update on Pennsylvania DEP Agreement State Status with the NRC; and (10) Elect Commission Officers. At this meeting, the Commission decided to officially request that the LLRW generators in the Compact provide the Commission with information regarding storage of Class B and C wastes. The information requested will include waste type, volume, activity, class of waste and storage capacity.

Additionally, the Commission adopted Resolution 2008-1 that states, "RESOLVED, that for purposes of the provisions of the Compact relating to designation of additional host states, that the applicable three-year period for testing the volume and curie content of waste generated by any party state shall be the period commencing January 1, 2006 and ending December 31, 2008, and each successive three year period thereafter." "RESOLVED, that for purposes of the provisions of the Compact relating to the designation of additional host states that the accounting or measurement of the volume and curie content of waste generated by any party state shall be determined based upon waste manifested for disposal at a Part 61 or equivalent Agreement State licensed facility." "RESOLVED, that inasmuch as Pennsylvania has suspended the siting

process, it is the sense of the Commission that no other state be expected to commence a siting process."

In March 2009, a representative from the Commission attended the LLW Forum meeting in Columbia, South Carolina. This meeting included a tour of the Barnwell LLRW disposal facility.

In May 2009, the Commission published its annual report for fiscal year 2007-08. This report includes the Independent Auditors' Report.

Public Information Depositories

An information depository exists in four of the DEP regional offices and the Commonwealth Library in Harrisburg. These locations serve as depositories where interested parties may review information on the LLRW Program. A complete list of the LLRW Program information depositories is provided in Table 2-1.

If you have trouble finding the DEP's LLRW material, please call 1-800-232-2786 for information or visit DEP's Web site listed on the back cover of this report.

TABLE 2-1

LOW-LEVEL RADIOACTIVE WASTE PROGRAM INFORMATION DEPOSITORIES

The following Commonwealth offices were supplied with copies of DEP's LLRW literature. If you have trouble finding DEP's LLRW material at any of these facilities, please call 1-800-232-2786 for information or visit the DEP's Web site listed on the back cover of this report.

DEP Regional Offices and The Commonwealth Library

Northwest Regional Office
230 Chestnut St.
Meadville, PA 16335-3481
814-332-6945

Southeast Regional Office
2 E. Main St.
Norristown, PA 19401
484-250-5900

Southcentral Regional Office
909 Elmerton Ave.
Harrisburg, PA 17110-8200
717-705-4700

Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745
412-442-4000

Mailing Address:

Bureau of State Library
333 Market St.
Harrisburg, PA 17126
717-787-3273

CHAPTER 3

WASTE QUANTITIES GENERATED

Radioactive waste is radioactive material judged by the licensee as being no longer useful for its intended purpose. Radioactive waste can also be legacy waste resulting from a past contamination of a facility. This legacy waste enters the waste stream after a facility is decontaminated. Radioactive waste can be generally categorized as high-level, low-level, by-product material, special nuclear material, and transuranics or a combination of these. Radioactive waste can also be mixed with hazardous non-radioactive waste, which is generally referred to as a mixed waste.

LLRW is waste that satisfies the definition in the Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA) of 1985. The LLRWPAA defines LLRW as, "radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel or byproduct material as defined in Section 11e.2 of the Atomic Energy Act of 1954 and; (B) which the Nuclear Regulatory Commission, consistent with existing law and in accordance with paragraph (A), classifies as low-level radioactive waste."

Any LLRW that requires disposal at a licensed facility is considered generated waste, and the institution or person that produces the waste is considered a generator. Since 1998 commercial LLRW is tabulated by date, in the MIMS system, for the date it was actually disposed of at the Barnwell or the Energy Solutions (formerly called Envirocare) LLRW disposal facilities. The LLRW disposed of at a Department of Energy (DOE) site is not included in this report.

Generators of LLRW can be categorized according to the type of operation or service they conduct. In the Compact, waste generator types are categorized as nuclear power plant (utility), medical, academic, government or industrial.

Nuclear power plants include all the nuclear reactors that are used for generation of electricity in the Compact. Medical facilities include hospitals, clinics, and medical colleges where radioactive materials are used for medical applications. Academic facilities include universities and other institutions of higher learning that generate LLRW. Government facilities include federal, state, county and municipal operated institutions that generate LLRW. Industrial facilities may generate LLRW as part of the manufacturing process, research, waste-volume reduction, sample analysis, and facility or equipment decontamination.

Pennsylvania and Appalachian Compact LLRW Quantities

As of July 1, 2008, the Barnwell LLRW disposal site in South Carolina no longer accepts LLRW from outside of the Atlantic Compact. Therefore, the LLRW generators within the Compact no longer have a disposal option for Class B and C wastes, and certain types of Class A waste. Both Pennsylvania and the Commission are monitoring and tracking the generation of these types of wastes, which are now being stored by the LLRW generators in the Compact.

Pennsylvania generated the largest quantities of LLRW among the Compact states. Quantities of LLRW by facility type and state for 2009 are listed in Tables and Charts B-1 and B-2.

The total volume of waste disposed of by the Compact LLRW generators in 2009 is about 125,684 cubic feet. The LLRW volume disposed of from the Compact in 2009 was mainly due to waste from the government, utility, and industrial categories (see Table and Chart B-1). The 2009 LLRW activity (radioactivity) from the compact is about 1,006 curies. The greatest

contribution is from the nuclear utility sector (see Table and Chart B-2). The disposal volume and activity tabulated in the aforementioned tables and charts only apply to Class A LLRW, as there are currently no disposal options for Class B and C wastes due to inaccessibility of the Barnwell LLRW disposal site.

The significant contribution of waste volume by the government category in 2009 is due to disposal of low activity decontamination waste from the Pennsylvania DEP, Hazardous Sites Cleanup Act (HSCA) radium decontamination project in Lock Haven, Clinton County. Another major contributor to the volume of waste is the industry category. This is due to on going clean-up of legacy LLRW along with routine industrial LLRW generation at several commercial facilities.

LLRW must be classified according to 10 CFR 61.55 before it can be shipped for disposal. In 2009, all LLRW disposed of was Class A.

Table B-3 contains information on the radioactive isotopes in the LLRW disposed from the Compact in 2009. The radioactive isotopes are arranged by isotope, half-life, and activity. The characterization and quantification of these isotopes are generally performed several months prior to disposal. Therefore, due to the short half-life of some listed isotopes and the in-growth of some others, the actual isotopic characterization and radioactivity will be different at the time of disposal.

A recent survey of LLRW generators in the compact indicates that nearly the entire radioactivity of the LLRW in storage is from Class B and C wastes being stored at the nuclear power plants. Additionally, two generators in the industrial sector reported storing a small amount of Class B waste. Table B-7 contains information on LLRW in storage for the period of Jan. 1, 2009 to Dec. 31, 2009.

Waste Minimization

Waste minimization can be accomplished by two different methods: source reduction and volume reduction. Source reduction is achieved by process modification, materials replacement, and segregation. Volume reduction is generally achieved by compaction or incineration. Appendix C discusses volume and activity trends from 1990 to 2009.

Toxicity of Low-Level Radioactive Waste

The toxicity of LLRW is a function of its constituent radionuclides. Toxicity is based on drinking water standards and expressed in two ways, as shown in Table A-2 of Appendix A.

Toxicity is first expressed as the annual concentration in picocuries per liter (pCi/L) of beta particle and photon radioactivity in drinking water that produces an annual dose equivalent to the total body or any internal organ of no more than 4 millirems (mrem) per year.[1] For gross alpha emitting radionuclides, excluding radon and uranium, the maximum contaminant level (MCL) in drinking water is 15 pCi/L.[2] For combined radium-226 and radium-228, the MCL in drinking water is 5 pCi/L.[3] The second column of Table A-2 shows radionuclide concentrations in pCi/L

[1] Based on 40 CFR 141.16(a), and proposed revision to 40 CFR 141, published as Appendix C on Sept. 30, 1986, 51 FR 34859.

[2] 40 CFR 141.15(b)

[3] 40 CFR 141.15(a)

in drinking water that would yield a risk equal to that from a dose rate of 4 mrem per year. Lower concentration quantity indicates higher toxicity.

The second mode of indicating toxicity is by comparing toxicity of each radionuclide to that of tritium (H-3) and expressing it as relative toxicity. Tritium is one of the least toxic of radionuclides and is assigned a value of 1. Relative toxicity of other radionuclides is calculated in column three of Table A-2, where higher numbers indicate higher toxicity. Radionuclides are listed without their half-lives in Table A-2; however, arrangement of radionuclides by their half-life ranges is provided in Table B-3, which is also arranged by nuclide and activity.

CHAPTER 4

FINANCIAL STATISTICS

The Pennsylvania LLRW Disposal Act requires the annual report to include financial statistics relating to all aspects of the (Act 1988-12) Compact and the regional disposal facility. This chapter includes financial information on the host state of Pennsylvania and the Commission.

Pennsylvania Law, in the form of the Low-Level Radioactive Waste Disposal Act and the Low-Level Radioactive Waste Disposal Regional Facility Act (Act 1990-107), established funds to pay the costs of developing a LLRW disposal facility in Pennsylvania. Funds were generated from mandatory contributions by nuclear power utilities in Pennsylvania and voluntary contributions from a nuclear utility in Maryland. The maximum amount of money mandated for the Regional Facility Siting Fund was about $33 million.

Pennsylvania General Fund money was also appropriated for the LLRW Program. The acts state that funds used from the General Fund must be repaid to that fund within five years after the LLRW facility begins disposal operations. Repayments to the General Fund will be taken from surcharges on the waste during facility operation.

Expenditures of the Host State and the Appalachian Compact Commission

Table 4-1 contains the financial information of the host state, Pennsylvania, and the Commission for calendar year 2009 and fiscal year 2008-09 respectively.

TABLE 4-1

Pennsylvania and Appalachian Compact Commission Expenditures

EXPENDITURES	PENNSYLVANIA (HOST STATE) CY 2009	FY 2008-09 APPALACHIAN COMPACT COMMISSION
GRANTS	**$0.00**	**$0.00**
PERSONNEL	**$119,606.09**	**$0.00**
GENERAL EXPENSE	**$14,367.98**	**$30,637.00**
CONTRACTOR SERVICES	**$0.00**	**$0.00**
TOTAL	**$133,974.07**	**$30,637.00**

APPENDIX A

TABLE A-1

APPALACHIAN COMPACT LLRW DISPOSERS BY STATE AND COUNTY FOR 2009

Pennsylvania

County	Facility	Generator Type
Adams	Gettysburg College	Academic
Allegheny	Applied Health Physics, Inc.	Industry
	Curtiss-Wright Electro-Mechanical Corp.	Industry
	Duquesne University	Academic
	RJ Lee Group	Industry
	Schaffner Manufacturing	Industry
	VA Medical Center/Pittsburgh, PA	Government
Beaver	First Energy Beaver Valley	Utility
Berks	Glen-Gery Brick	Industry
Bradford	Global Tungsten and Powders Corp.	Industry
	Guthrie Foundation	Industry
Bucks	Nashaminy School District	Academic
Butler	II-VI, Inc.	Industry
Centre	Mount Nittany Medical Center	Medical
	Pennsylvania State University	Academic
Chester	Sanofi-Synthelabo	Industry
Clinton	PA DEP - Karnish Lock Haven	Government
	Keystone Instruments	Industry
Dauphin	Exelon Corporation Three Mile Island	Utility
Erie	Copes Vulcan	Industry
Lancaster	Strube, Inc.	Industry
Lawerence	Alaron Corp.	Industry
Luzerne	Army Corp. Engineers - Safety Light Site	Government
	PPL Susquehanna SES	Utility
	Susquehanna University	Academic
	Wyoming Area High School	Academic
Mifflin	Lewistown Hospital	Medical
Montgomery	Exelon Corporation Limerick	Utility
	Genaera Corporation	Industry
	Glaxo Smith Kline Beecham	Industry
	Lionville Laboratories	Industry
	Merck & Co.	Industry
	Neose Technologies	Industry
	Petnet Pharmaceuticals	Industry
	Quest Diagnostics Clinical Laboratories	Industry
	R.W. Johnson Pharm Research Institute	Industry
	Therakos, Inc	Industry
Philadelphia	Camden Iron and Metal	Industry
	University of the Sciences	Academic
Pike	Walmart Milford	Industry
Westmoreland	Westinghouse Madison	Industry
York	Exelon Corporation Peach Bottom	Utility

Delaware

County	Facility	Generator Type
New Castle	Agilent Technologies, Inc	Industry
	Astra-Zeneca	Industry
	Dupont	Industry
	Rodel, Inc.	Industry
	University of Delaware	Academic

Maryland

County	Facility	Generator Type
Anne Arundel	Anne Arundel County Waste Management Services	Government
	Caliper Discovery Alliance and Services	Industry
	Oceanix Biosciences	Industry
	Smithsonian Institute	Industry
Baltimore City	Alba Therapeutics	Industry
	Amtrak	Government
	Cambridge Iron and Metal	Industry
	Fasgen	Industry
	Invitro Technologies	Industry
	Johns Hopkins Asthma & Allergy Center	Medical
	Johns Hopkins Medical Institutions	Medical
	Johns Hopkins University	Academic
	National Institute on Drug Abuse	Government
	Universal Food Corporation	Industry
	Veterans Administration Medical Ctr.	Government
Calvert	Calvert Cliffs Nuclear Power Plant	Utility
	Calvert Memorial Hospital	Medical
	Chesapeake Biological Labortories	Industry
Frederick	Allied Waste, Inc	Industry
	Hood College	Academic
	Medimmune, Inc.	Industry
	SAIC	Industry
Howard	Ecology Services, Inc.	Industry
	Shimadzu Scientific Instruments	Industry
	Washington Biotechnology, Inc.	Industry
Military	DOD Aberdeen Proving Grounds	Government
	US Navy	Government
Montgomery	Adaptive Technologie	Industry
	American Red Cross	Industry
	Bioqual Inc.	Industry
	Covanta Montgomery, Inc	Industry
	Entremed, Inc.	Industry
	FDA Center for Devices & Rad. Health	Government
	Food and Drug Administration BRF	Government
	Genvec Inc.	Industry
	Henry M. Jackson Foundation	Industry

	Merck & CO, Inc.	Industry
	National Institute of Enviromental Health	Government
	National Institute of Health	Government
	National Institute of Standards & Technologies	Government
	National Institutes of Health	Government
	Neutron Products, Inc.	Industry
	Otsuka America Pharmaceutical	Industry
	Teva Biopharmaceuticals Inc.	Industry
	Wellstat Therapeutics	Industry
Prince Georges	Food and Drug Administration	Government
	Receptor Biology, Inc.	Industry
	United States Department of Agriculture Research Center	Government
	University of Maryland	Academic

West Virginia

County	Facility	Generator Type
Raleigh	Beckley VA Medical Center	Medical
Cabell	Marshall University	Academic
	Steel of West Virginia	Industry
Greenbrier	West Virginia School of Medicine	Academic
Kanawha	US EPA	Government
Logan	Tennessee Valley Health Care System	Medical
Mineral	Alliant Tech Systems	Industry
Monongalia	West Virginia University Health	Medical
Raleigh	Walmart Macarthur	Industry
	Raleigh General Hospital	Medical
Wood	E. I. Dupont	Industry

TABLE A-2
TOXICITY TABLE OF INDIVIDUAL RADIONUCLIDES

Radionuclides	Concentration[a] (pCi/L)	Relative[b] Toxicity	Radionuclides	Concentration[a] (pCi/L)	Relative[b] Toxicity
Tritium (H-3)	9.0E04	1.0	Europium-155	7.0E03	12.9
Americium-241	4.0E00	22,500.0	Gadolinium-153	1.0E04	9.0
Americium-23	1.5E01	6,000.0	Hafnium-181	3.0E03	30.0
Antimony-122	2.0E03	45.0	Iodine-125	1.0E03	90.0
Antimony-124	1.0E03	90.0	Iodine-129	1.0E02	900.0
Antimony-125	4.0E03	22.5	Iodine-131	7.0E02	128.6
Barium-131	7.0E03	12.9	Iodine-133	4.0E02	225.0
Barium-140	1.0E03	90.0	Iridium-192	2.0E03	45.0
Beryllium-7	1.0E05	0.9	Iron-55	1.0E04	9.0
Bismuth-207	2.0E03	45.0	Iron-59	1.0E03	90.0
Cadmium-109	5.0E02	180.0	Lanthanum-140	1.0E03	90.0
Calcium-45	2.0E03	45.0	Lead-203	1.0E04	9.0
Californium-252	1.5E01	6,000.0	Manganese-54	3.0E03	30.0
Carbon-14	3.0E03	30.0	Neptunium-237	1.5E01	6,000.0
Cerium-141	4.0E03	22.5	Nickel-59	3.0E04	3.0
Cesium-134	8.0E01	1,125.0	Nickel-63	1.0E04	9.0
Cesium-136	5.0E02	180.0	Niobium-95	5.0E03	18.0
Cesium-137	1.0E02	900.0	Phosphorus-32	7.0E02	128.6
Chlorine-36	2.0E03	45.0	Plutonium-238	1.5E01	6,000.0
Chromium-51	8.0E04	1.1	Plutonium-239	4.0E01	2,250.0
Cobalt-57	6.0E03	15.0	Plutonium-240	1.5E01	6,000.0
Cobalt-58	2.0E03	45.0	Plutonium-241	1.5E01	6,000.0
Cobalt-60	2.0E02	450.0	Plutonium-242	1.5E01	6,000.0
Curium-242	1.5E01	6,000.0	Polonium-210	1.5E01	6,000.0
Curium-243	1.5E01	6,000.0	Promethium-149	3.0E03	30.0
Curium-244	1.5E01	6,000.0	Protactinium-233	3.0E03	30.0
Europium-152	2.0E03	45.0	Radium-226	1.5E01	6,000.0
Europium-154	1.0E03	90.0	Rubidium-86	6.0E02	150.0
Ruthenium-103	4.0E03	22.5	Ruthenium-106	3.0E02	300.0
Scandium-46	2.0E03	45.0	Selenium-75	6.0E02	150.0
Silver-110M	7.0E02	128.6	Sodium-22	5.0E02	180.0
Sodium-24	4.0E03	22.5	Strontium-85	4.0E03	22.5
Strontium-89	9.0E02	100.0	Strontium-90	5.0E01	1,800.0
Sulfur-35	1.0E04	9.0	Tantalum-182	2.0E03	45.0
Technetium-99	5.0E03	18.0	Tellurium-125M	2.0E03	45.0
Thorium-228	1.5E01	6,000.0	Thorium-230	1.5E01	6,000.0
Thorium-232	1.5E01	6,000.0	Thallium-202	4.0E03	22.5
Thallium-204	2.0E03	45.0	Tin-113	4.0E03	22.5
Transuranics	1.5E01	6,000.0	Vanadium-48	2.0E03	45.0
Yttrium-90	1.0E03	90.0	Yttrium-91	1.0E03	90.0
Zinc-65	4.0E02	225.0	Zirconium-95	3.0E03	30.0

[a] Concentration of beta and photon radioactivity in drinking water yielding a risk equal to that from a dose rate of 4 mrem/year (proposed revision to 40 CFR 141, 51 FR 34859, Sept. 30, 1986).

[b] Toxicity of radionuclides compared to tritium, which has a value of 1.

APPENDIX B

TABLE B-1

Appalachian Compact 2009 Disposed LLRW Volume by State and Facility Type

Facility Type/State	WV	DE	MD	PA	Total
Academic	40.2	5.4	8.0	243.7	297.3
Government	12.0	0	17,413.9	39,637.7	57,063.6
Industry	6.5	425.8	884.1	16,458.3	17,774.7
Medical	75.4	0	254.4	8.2	338.0
Utility	0	0	2,890.9	47,319.0	50,209.9
Total	134.1	431.2	21,451.3	103,666.9	125,683.5

This data is from the Pennsylvania DEP and the MIMS – U.S. Department of Energy as of May 2010. Volume is in cubic feet. This data is for LLRW burial at the Energy Solutions site in Clive, Utah.

CHART B-1

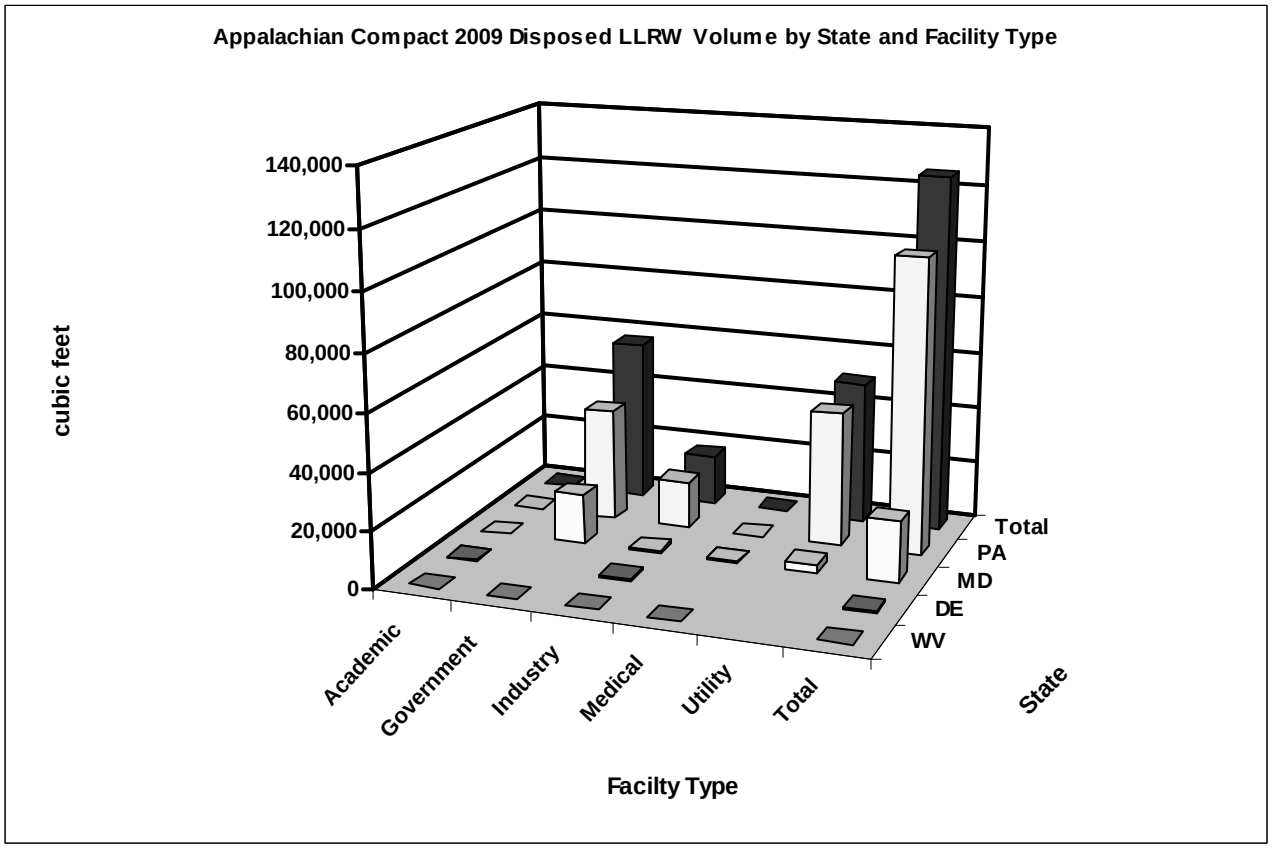


TABLE B-2

Appalachian Compact 2009 Disposed LLRW Activity by State and Facility Type

Facility Type/State	WV	DE	MD	PA	Total
Academic	<0.01	<0.01	0.01	0.16	0.17
Government	<0.01	0	0.17	1.72	1.9
Industry	<0.01	0.51	2.76	49.88	53.2
Medical	0.02	0	0.56	0.08	0.7
Utility	0	0	1.21	949.56	950.8
Total	0.02	0.5	4.7	1,001.4	1,006.6

This data is from the Pennsylvania DEP and the MIMS – U.S. Department of Energy as of May 2010. Activity is in curies. This data is for LLRW burial at the Energy Solutions site in Clive, Utah.

CHART B-2

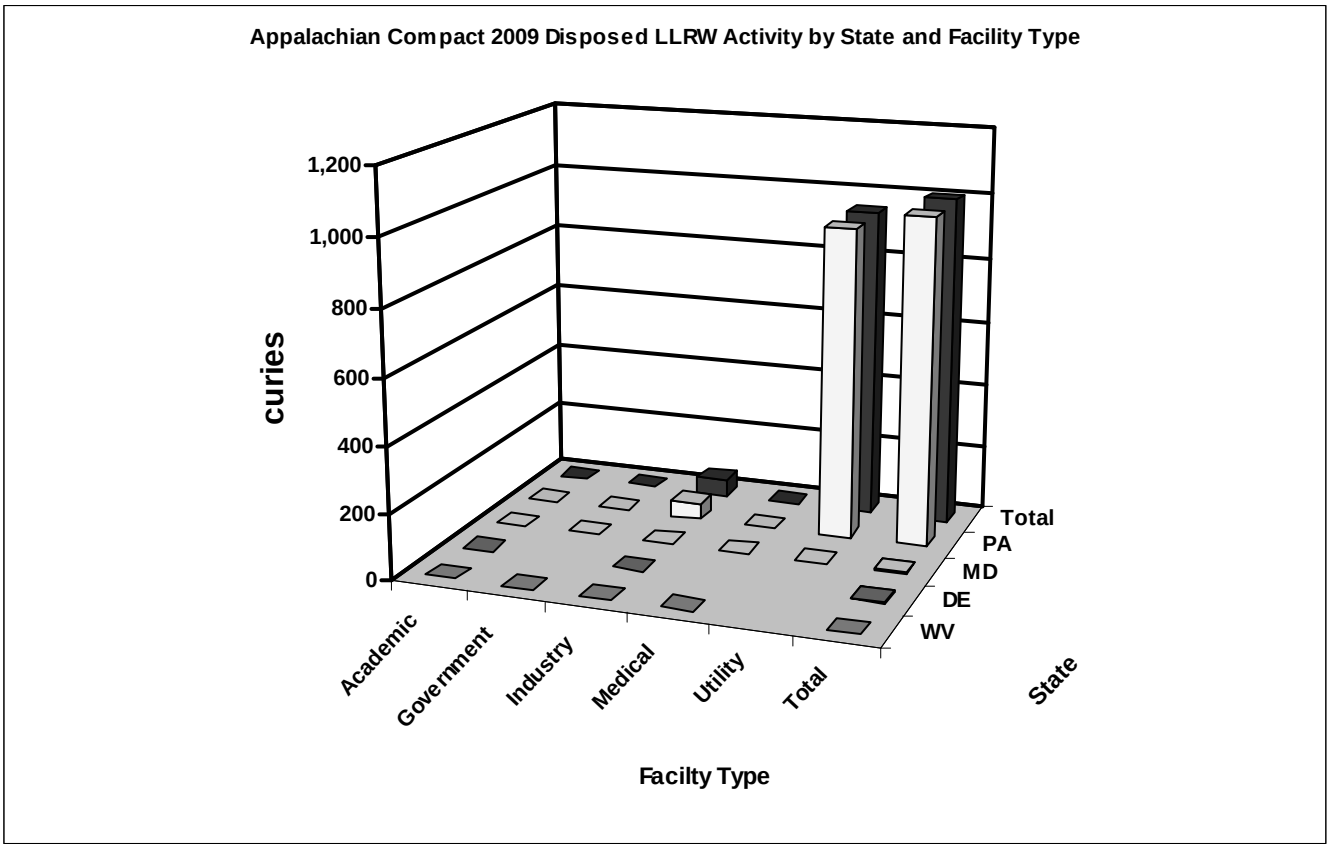


TABLE B-3: Appalachian Compact 2009 LLRW Isotopes Sorted by Isotope

Isotope	Element	Half-life (yrs)	Curies		Isotope	Element	Half-life (yrs)	Curies
Ag-108m	silver	1.2700E+02	0.045		P-32	phosphorus	3.9124E-02	0.85
Ag-110m	silver	6.8405E-01	0.19		P-33	phosphorus	6.9542E-02	0.035
Am-241	americium	4.3220E+02	0.11		Pa-234	protactinium	7.6432E-04	<0.01
Am-242m	americium	1.5200E+02	<0.01		Pb-210	lead	2.2260E+01	0.01
Am-243	americium	7.3800E+03	<0.01		Pm-147	promethium	2.6234E+00	<0.01
Ba-133	barium	1.0500E+01	0.015		Po-210	polonium	3.7887E-01	<0.01
Ba-140	barium	3.5015E-02	0.015		Pu-238	plutonium	8.7750E+01	0.11
Be-7	beryllium	1.4631E-01	0.01		Pu-239	plutonium	2.4131E+04	0.11
C-14	carbon	5.7300E+03	14.66		Pu-240	plutonium	6.5370E+03	0.025
Ca-45	calcium	4.4545E-01	2.76		Pu-241	plutonium	1.4400E+01	1.05
Cd-109	cadmium	1.2704E+00	0.03		Pu-242	plutonium	3.7580E+05	0.01
Cd-113m	cadmium	1.3700E+01	<0.01		Ra-226	radium	1.6000E+03	1.785
Ce-141	cerium	8.8981E-02	0.03		Rh-105	rhodium	4.0338E-03	<0.01
Ce-144	cerium	7.7837E-01	1.985		Ru-103	ruthenium	1.0773E-01	0.015
Cl-36	chlorine	3.0100E+05	<0.01		Ru-106	ruthenium	1.0081E+00	0.03
Cm-242	curium	4.4682E-01	0.1		S-35	sulfur	2.3940E-01	0.18
Cm-243	curium	2.8500E+01	0.095		Sb-122	antimony	7.3922E-03	<0.01
Cm-244	curium	1.8110E+01	0.015		Sb-124	antimony	1.6482E-01	0.025
Co-56	cobalt	2.1563E-01	0.055		Sb-125	antimony	2.7700E+00	0.315
Co-57	cobalt	7.4169E-01	3.525		Sc-46	scandium	2.2943E-01	<0.01
Co-58	cobalt	1.9384E-01	2.84		Sm-151	samarium	9.0000E+01	<0.01
Co-60	cobalt	5.2710E+00	174.89		Sn-113	tin	3.1513E-01	0.055
Cr-51	chromium	7.5850E-02	0.46		Sn-117m	tin	3.7235E-02	<0.01
Cs-134	cesium	2.0620E+00	0.405		Sr-89	strontium	1.3840E-01	0.075
Cs-137	cesium	3.0170E+01	13.96		Sr-90	strontium	2.8600E+01	0.425
Eu-152	europium	1.3600E+01	<0.01		Sr-92	strontium	3.0915E-04	0.01
Eu-154	europium	8.8000E+00	<0.01		Ta-182	tantalum	3.1414E-01	0.01
Eu-155	europium	4.9600E+00	<0.01		Tc-99	technetium	2.1300E+05	0.06
Fe-55	iron	2.7000E+00	420.495		Te-121	tellurium	4.5996E-02	<0.01
Fe-59	iron	1.2219E-01	0.175		Th-228	thorium	1.9132E+00	<0.01
H-3	tritium	1.2280E+01	94.1		Th-230	thorium	7.7000E+04	<0.01
Hf-181	hafnium	1.1606E-01	0.015		Th-232	thorium	1.4050E+10	4.17
I-125	iodine	1.6466E-01	0.05		Th-234	thorium	6.5982E-02	<0.01
I-129	iodine	1.5700E+07	0.04		Th-NAT	natural thorium	1.4050E+10	0.055
I-131	iodine	2.2012E-02	0.01		U-234	uranium	2.4450E+05	0.01
Kr-85	krypton	1.0720E+01	<0.01		U-235	uranium	7.0380E+08	0.015
La-140	lanthanum	4.5882E-03	0.01		U-236	uranium	3.4150E+06	<0.01
Mn-54	manganese	8.5613E-01	34.48		U-238	uranium	4.4680E+09	0.035
Na-22	sodium	2.6020E+00	0.26		U-DEP	depleted uranium	4.4680E+09	3.085
Nb-94	niobium	2.0300E+04	0.01		U-NAT	natural uranium	4.4680E+09	0.445
Nb-95	niobium	9.5989E-02	0.265		W-181	tungsten	3.3114E-01	<0.01
Nb-97	niobium	1.3708E-04	<0.01		Y-90	yttrium	7.3124E-03	<0.01
Ni-59	nickel	7.5000E+04	0.165		Zn-65	zinc	6.6913E-01	34.25
Ni-63	nickel	1.0010E+02	49.86		Zr-95	zirconium	1.7528E-01	0.315
Np-237	neptunium	2.1400E+06	<0.01					

TABLE B-3: Appalachian Compact Pennsylvania 2009 LLRW Isotopes Sorted by Activity

Isotope	Element	Half-life (yrs)	Curies		Isotope	Element	Half-life (yrs)	Curies
Fe-55	iron	2.7000E+00	420.495		Ce-141	cerium	8.8981E-02	0.03
Co-60	cobalt	5.2710E+00	174.89		Ru-106	ruthenium	1.0081E+00	0.03
H-3	tritium	1.2280E+01	94.1		Pu-240	plutonium	6.5370E+03	0.025
Ni-63	nickel	1.0010E+02	49.86		Sb-124	antimony	1.6482E-01	0.025
Mn-54	manganese	8.5613E-01	34.48		Ba-133	barium	1.0500E+01	0.015
Zn-65	zinc	6.6913E-01	34.25		Ba-140	barium	3.5015E-02	0.015
C-14	carbon	5.7300E+03	14.66		Cm-244	curium	1.8110E+01	0.015
Cs-137	cesium	3.0170E+01	13.96		Hf-181	hafnium	1.1606E-01	0.015
Th-232	thorium	1.4050E+10	4.17		Ru-103	ruthenium	1.0773E-01	0.015
Co-57	cobalt	7.4169E-01	3.525		U-235	uranium	7.0380E+08	0.015
U-DEP	depleted uranium	4.4680E+09	3.085		Be-7	beryllium	1.4631E-01	0.01
Co-58	cobalt	1.9384E-01	2.84		I-131	iodine	2.2012E-02	0.01
Ca-45	calcium	4.4545E-01	2.76		La-140	lanthanum	4.5882E-03	0.01
Ce-144	cerium	7.7837E-01	1.985		Nb-94	niobium	2.0300E+04	0.01
Ra-226	radium	1.6000E+03	1.785		Pb-210	lead	2.2260E+01	0.01
Pu-241	plutonium	1.4400E+01	1.05		Pu-242	plutonium	3.7580E+05	0.01
P-32	phosphorus	3.9124E-02	0.85		Sr-92	strontium	3.0915E-04	0.01
Cr-51	chromium	7.5850E-02	0.46		Ta-182	tantalum	3.1414E-01	0.01
U-NAT	natural uranium	4.4680E+09	0.445		U-234	uranium	2.4450E+05	0.01
Sr-90	strontium	2.8600E+01	0.425		Am-242m	americium	1.5200E+02	<0.01
Cs-134	cesium	2.0620E+00	0.405		Am-243	americium	7.3800E+03	<0.01
Sb-125	antimony	2.7700E+00	0.315		Cd-113m	cadmium	1.3700E+01	<0.01
Zr-95	zirconium	1.7528E-01	0.315		Cl-36	chlorine	3.0100E+05	<0.01
Nb-95	niobium	9.5989E-02	0.265		Eu-152	europium	1.3600E+01	<0.01
Na-22	sodium	2.6020E+00	0.26		Eu-154	europium	8.8000E+00	<0.01
Ag-110m	silver	6.8405E-01	0.19		Eu-155	europium	4.9600E+00	<0.01
S-35	sulfur	2.3940E-01	0.18		Kr-85	krypton	1.0720E+01	<0.01
Fe-59	iron	1.2219E-01	0.175		Nb-97	niobium	1.3708E-04	<0.01
Ni-59	nickel	7.5000E+04	0.165		Np-237	neptunium	2.1400E+06	<0.01
Am-241	americium	4.3220E+02	0.11		Pa-234	protactinium	7.6432E-04	<0.01
Pu-238	plutonium	8.7750E+01	0.11		Pm-147	promethium	2.6234E+00	<0.01
Pu-239	plutonium	2.4131E+04	0.11		Po-210	polonium	3.7887E-01	<0.01
Cm-242	curium	4.4682E-01	0.1		Rh-105	rhodium	4.0338E-03	<0.01
Cm-243	curium	2.8500E+01	0.095		Sb-122	antimony	7.3922E-03	<0.01
Sr-89	strontium	1.3840E-01	0.075		Sc-46	scandium	2.2943E-01	<0.01
Tc-99	technetium	2.1300E+05	0.06		Sm-151	samarium	9.0000E+01	<0.01
Co-56	cobalt	2.1563E-01	0.055		Sn-117m	tin	3.7235E-02	<0.01
Sn-113	tin	3.1513E-01	0.055		Te-121	tellurium	4.5996E-02	<0.01
Th-NAT	natural thorium	1.4050E+10	0.055		Th-228	thorium	1.9132E+00	<0.01
I-125	iodine	1.6466E-01	0.05		Th-230	thorium	7.7000E+04	<0.01
Ag-108m	silver	1.2700E+02	0.045		Th-234	thorium	6.5982E-02	<0.01
I-129	iodine	1.5700E+07	0.04		U-236	uranium	3.4150E+06	<0.01
P-33	phosphorus	6.9542E-02	0.035		W-181	tungsten	3.3114E-01	<0.01
U-238	uranium	4.4680E+09	0.035		Y-90	yttrium	7.3124E-03	<0.01
Cd-109	cadmium	1.2704E+00	0.03					

TABLE B-3: Appalachian Compact 2009 LLRW Isotopes Sorted by Half-life

Isotope	Element	Half-life (yrs)	Curies		Isotope	Element	Half-life (yrs)	Curies
Nb-97	niobium	1.3708E-04	<0.01		Pm-147	promethium	2.6234E+00	<0.01
Sr-92	strontium	3.0915E-04	0.01		Fe-55	iron	2.7000E+00	420.5
Pa-234	protactinium	7.6432E-04	<0.01		Sb-125	antimony	2.7700E+00	0.315
Rh-105	rhodium	4.0338E-03	<0.01		Eu-155	europium	4.9600E+00	<0.01
La-140	lanthanum	4.5882E-03	0.01		Co-60	cobalt	5.2710E+00	174.89
Y-90	yttrium	7.3124E-03	<0.01		Eu-154	europium	8.8000E+00	<0.01
Sb-122	antimony	7.3922E-03	<0.01		Ba-133	barium	1.0500E+01	0.015
I-131	iodine	2.2012E-02	0.01		Kr-85	krypton	1.0720E+01	<0.01
Ba-140	barium	3.5015E-02	0.015		H-3	tritium	1.2280E+01	94.1
Sn-117m	tin	3.7235E-02	<0.01		Eu-152	europium	1.3600E+01	<0.01
P-32	phosphorus	3.9124E-02	0.85		Cd-113m	cadmium	1.3700E+01	<0.01
Te-121	tellurium	4.5996E-02	<0.01		Pu-241	plutonium	1.4400E+01	1.05
Th-234	thorium	6.5982E-02	<0.01		Cm-244	curium	1.8110E+01	0.015
P-33	phosphorus	6.9542E-02	0.035		Pb-210	lead	2.2260E+01	0.01
Cr-51	chromium	7.5850E-02	0.46		Cm-243	curium	2.8500E+01	0.095
Ce-141	cerium	8.8981E-02	0.03		Sr-90	strontium	2.8600E+01	0.425
Nb-95	niobium	9.5989E-02	0.265		Cs-137	cesium	3.0170E+01	13.96
Ru-103	ruthenium	1.0773E-01	0.015		Pu-238	plutonium	8.7750E+01	0.11
Hf-181	hafnium	1.1606E-01	0.015		Sm-151	samarium	9.0000E+01	<0.01
Fe-59	iron	1.2219E-01	0.175		Ni-63	nickel	1.0010E+02	49.86
Sr-89	strontium	1.3840E-01	0.075		Ag-108m	silver	1.2700E+02	0.045
Be-7	beryllium	1.4631E-01	0.01		Am-242m	americium	1.5200E+02	<0.01
I-125	iodine	1.6466E-01	0.05		Am-241	americium	4.3220E+02	0.11
Sb-124	antimony	1.6482E-01	0.025		Ra-226	radium	1.6000E+03	1.785
Zr-95	zirconium	1.7528E-01	0.315		C-14	carbon	5.7300E+03	14.66
Co-58	cobalt	1.9384E-01	2.84		Pu-240	plutonium	6.5370E+03	0.025
Co-56	cobalt	2.1563E-01	0.055		Am-243	americium	7.3800E+03	<0.01
Sc-46	scandium	2.2943E-01	<0.01		Nb-94	niobium	2.0300E+04	0.01
S-35	sulfur	2.3940E-01	0.18		Pu-239	plutonium	2.4131E+04	0.11
Ta-182	tantalum	3.1414E-01	0.01		Ni-59	nickel	7.5000E+04	0.165
Sn-113	tin	3.1513E-01	0.055		Th-230	thorium	7.7000E+04	<0.01
W-181	tungsten	3.3114E-01	<0.01		Tc-99	technetium	2.1300E+05	0.06
Po-210	polonium	3.7887E-01	<0.01		U-234	uranium	2.4450E+05	0.01
Ca-45	calcium	4.4545E-01	2.76		Cl-36	chlorine	3.0100E+05	<0.01
Cm-242	curium	4.4682E-01	0.1		Pu-242	plutonium	3.7580E+05	0.01
Zn-65	zinc	6.6913E-01	34.25		Np-237	neptunium	2.1400E+06	<0.01
Ag-110m	silver	6.8405E-01	0.19		U-236	uranium	3.4150E+06	<0.01
Co-57	cobalt	7.4169E-01	3.525		I-129	iodine	1.5700E+07	0.04
Ce-144	cerium	7.7837E-01	1.985		U-235	uranium	7.0380E+08	0.015
Mn-54	manganese	8.5613E-01	34.48		U-238	uranium	4.4680E+09	0.035
Ru-106	ruthenium	1.0081E+00	0.03		U-DEP	depleted uranium	4.4680E+09	3.085
Cd-109	cadmium	1.2704E+00	0.03		U-NAT	natural uranium	4.4680E+09	0.445
Th-228	thorium	1.9132E+00	<0.01		Th-232	thorium	1.4050E+10	4.17
Cs-134	cesium	2.0620E+00	0.405		Th-NAT	natural thorium	1.4050E+10	0.055
Na-22	sodium	2.6020E+00	0.26					

TABLE B-4

Appalachian Compact Class B and C LLRW in Storage Data for 2009

State	Facility Type	Total Class B&C Volume (Cubic Feet) *	Total Class B&C Activity (Curies) *	Remaining Storage Volume (Cubic Feet)	Waste Streams
PA	Utility 1	975	1,079	25,000	Ion Exchange, Filter Media
PA	Utility 2	605	6,000**	334	Ion Exchange
PA	Utility 3	136	915	10,320	Ion Exchange
PA	Utility 4	230	275	19,740	Ion Exchange, Filter Media
PA	Industry 1	2,340	19	****	Other – Mixed LLRW
MD	Utility 1	270	***	240 ****	Ion Exchange
MD	Industry 1	18	1,033	2,000	Dry Active Waste
DE	Industry 1	15	22	20	Sealed Sources

State	Facility Type	Total Class C Volume (Cubic Feet)	Total Class C Activity (Curies)	Remaining Storage Volume (Cubic Feet)	Waste Streams
PA	Utility 1	200	25,000	#	Irradiated Components
PA	Utility 3	420	***	#	Irradiated Components

*** Does not include irradiated reactor components due to differences in storage locations and capacity**

**** Activity was estimated**

***** Activity was not assessed at the time of the survey**

****** Some of the LLRW is stored off-site at Waste Control Specialists, LLC in Andrews, Texas**

 # irradiated reactor components are stored in the spent fuel pools

This data was compiled by the Pennsylvania DEP, Bureau of Radiation Protection, from a survey conducted by the member states of the Compact (Pennsylvania, Maryland, Delaware, and West Virginia). Storage Data is only for the LLRW placed into storage for the calendar year 2009. It does not include LLRW storage accumulation from previous years.

APPENDIX C

Discussion of Low-Level Radioactive Waste Trends in the Appalachian Compact

The Department of Energy's National Low-Level Waste Management Program's MIMS has been collecting data on LLRW generated in Pennsylvania since the beginning of 1986. MIMS data can be found on the Web site at this URL: http://mims.apps.em.doe.gov/ .

The total volume as calculated from the MIMS data for 2009 for the Compact LLRW generators is about 125,684 cubic feet. The LLRW volume increased slightly in 2009 compared to the previous year mainly due to a small increase in the amount of government-owned facilities decontamination and decommissioning waste (D&D) in 2009. It is difficult to predict the volume of D&D waste because it depends on several factors, such as the time frame designated for decommissioning activities and decisions made by corporate and regulatory authorities.

The traditional volume-reduction methods are not effective for most D&D waste, which generally consists of building debris and soil. On the other hand, D&D waste has extremely low radioactivity per volume (also known as low-specific activity) and can be disposed of at a less restrictive LLRW facility. Most of the commercial D&D waste produced in the United States is shipped to the Energy Solutions facility in Clive, Utah. Furthermore, most of this low-specific activity D&D waste would not have been disposed of at the proposed Pennsylvania LLRW site.

The 2009 LLRW activity (radioactivity) from the Compact is about 1,007 curies. This significant decrease from 2008 is mainly due to the closure of the Barnwell facility to waste disposal from outside the Atlantic Compact. This has a significant impact on the activity trend of LLRW in the Compact. For 2009 and until the time that the Compact generators of LLRW are allowed access to Class B and C disposal, the activity of this LLRW will only be tabulated as "waste in-storage" and will be reported as such.

The large spike in the volume of LLRW in 2000 and 2001 is mainly from the D&D waste. The significant increase in the activity level for the utility category in 1991 was due to a large amount of non-routine waste of irradiated components from nuclear power facilities.

It should be mentioned that the DOE's MIMS database does not include LLRW disposed of at the Energy Solutions facility prior to 1998. This omission of the historical data would affect waste generation trend information for volume, but would not have a significant impact on the radioactivity of LLRW. This is because, historically, 99 percent of the Compact's radioactivity of LLRW has been shipped to the Barnwell disposal site for burial. The MIMS database includes LLRW volume and activity data for the Barnwell disposal site from 1986 through 2008 for the Compact.

TABLE C-1: Appalachian Compact Disposed LLRW (cu. ft.) Volume from 1990 to 2009

Year	WV	DE	MD	PA	Total
1990	**95.2**	**843.8**	**17,037.9**	**101,604.1**	**119,581.1**
1991	**368.2**	**775.5**	**19,224.3**	**224,563.6**	**244,931.6**
1992	**192.2**	**986.5**	**17,673.6**	**93,189.4**	**112,041.6**
1993	**26.8**	**479.8**	**11,358.8**	**48,439.3**	**60,304.7**
1994	**81.8**	**374.8**	**8,421.1**	**51,441.6**	**60,319.3**
1995	**4.2**	**57.8**	**4,428.7**	**35,199.6**	**39,690.3**
1996	**34.8**	**127.2**	**3,391.1**	**24,203.1**	**27,756.1**
1997	**1.8**	**23.9**	**3,096.5**	**14,486.2**	**17,608.4**
1998	**48.0**	**173.8**	**7,604.6**	**42,686.0**	**50,512.4**
1999	**158.7**	**80.6**	**8,406.8**	**143,043.7**	**151,689.8**
2000	**53.4**	**27.6**	**9,766.8**	**421,398.1**	**431,246.0**
2001	**44.1**	**76.2**	**10,759.9**	**534,429.4**	**545,309.6**
2002	**183.3**	**366.4**	**6,752.8**	**55,371.4**	**62,673.8**
2003	**151.8**	**73.5**	**3,703.1**	**74,901.0**	**78,829.4**
2004	**34.8**	**48.8**	**13,177.8**	**55,136.0**	**68,397.4**
2005	**2.4**	**74.2**	**107,956.4**	**91,292.6**	**199,325.6**
2006	**38.02**	**59.2**	**48,131.8**	**57,627.7**	**105,856.8**
2007	**48.69**	**42.7**	**21,015.6**	**78,454.5**	**99,561.5**
2008	**132.15**	**414.8**	**6,702.5**	**113,483.2**	**120,732.6**
2009 *	**134.1**	**431.2**	**21,451.3**	**103,666.9**	**125,683.5**
Total 1990 to 2009	**1,700.3**	**5,107.0**	**328,609.9**	**2,260,950.5**	**grand total 2,722,051.3**

This data is from the Pennsylvania DEP and the MIMS – U.S. Department of Energy as of May 2010. Activity is in curies. * 2009 LLRW volume only includes burial at Energy Solutions in Clive, Utah. All other years include Barnwell, South Carolina, burial and Energy Solutions, Clive, Utah, burial.

CHART C-1

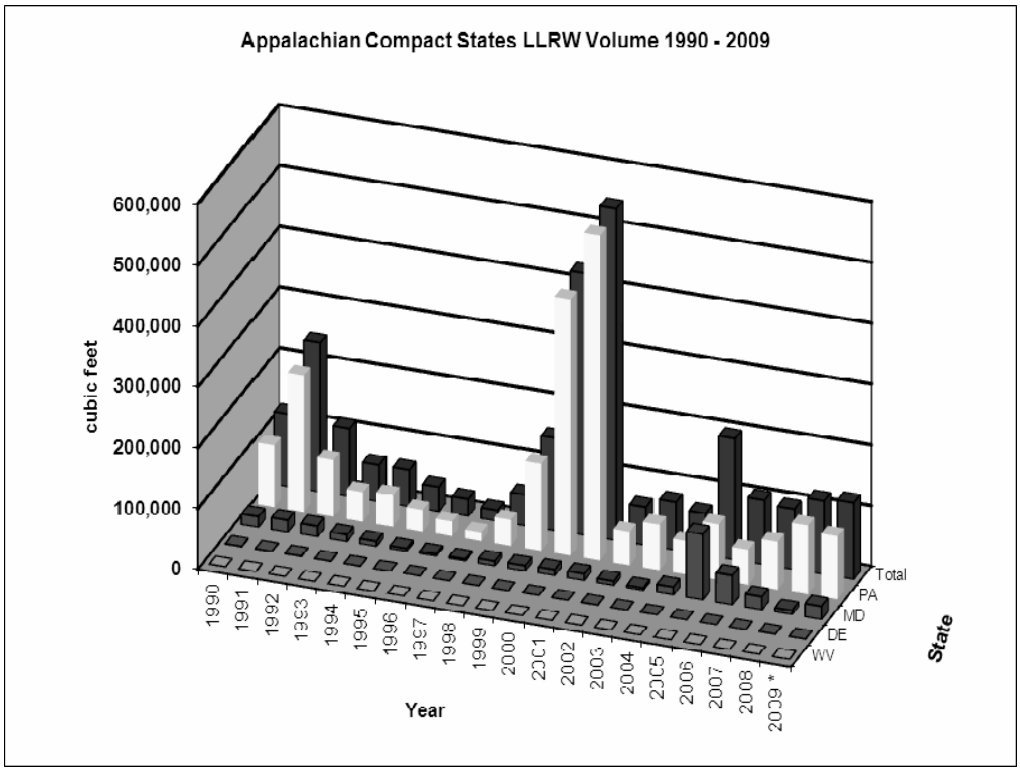
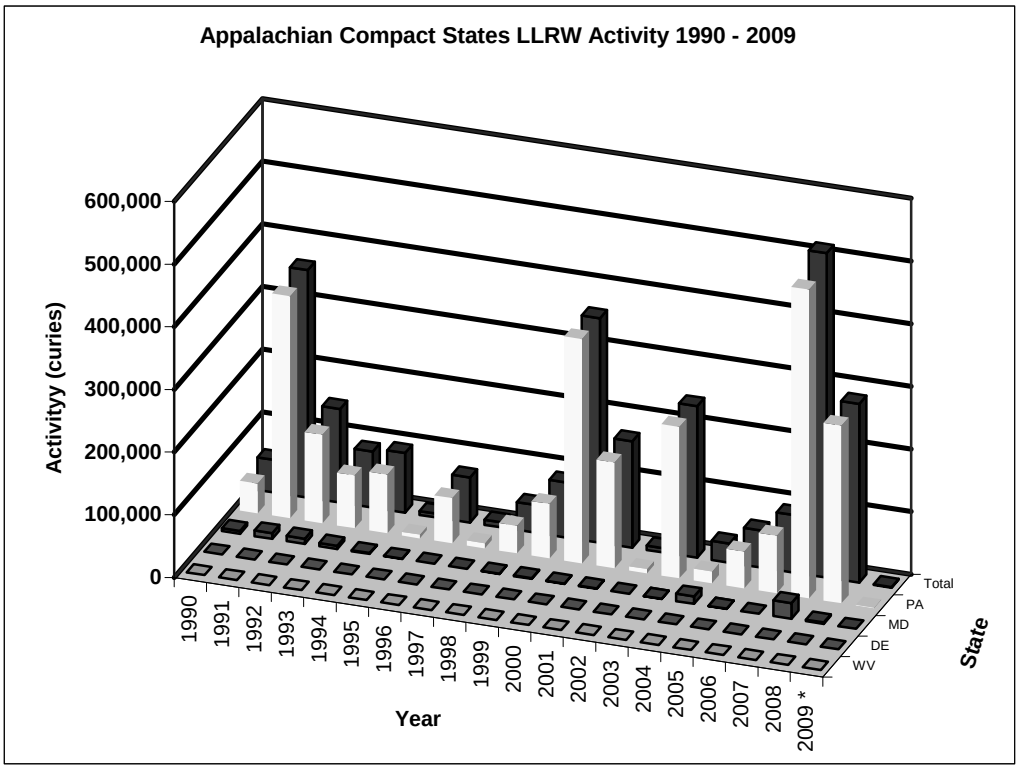


TABLE C-2. Appalachian Compact Disposed LLRW Activity (curies) from 1990 to 2009

Year	WV	DE	MD	PA	Total
1990	0.2	0.4	4,725.1	47,305.7	52,031.3
1991	15.5	0.6	8,969.0	354,340.7	363,325.8
1992	30.7	0.9	8,419.9	141,251.8	149,703.3
1993	5.5	45.1	5,019.4	84,346.7	89,416.7
1994	0.5	69.3	1,439.7	93,729.6	95,239.0
1995	4.6	0.01	346.2	5,691.9	6,042.7
1996	0.1	5.6	349.1	71,900.5	72,255.4
1997	0.03	1.3	198.5	8,017.9	8,217.7
1998	37.3	0.1	531.5	43,691.0	44,259.9
1999	0.5	0.1	1,335.7	86,618.0	87,954.3
2000	2.2	0.02	484.0	357,624.4	358,110.7
2001	0.03	0.03	903.3	168,919.6	169,822.9
2002	0.1	0.5	244.5	6,777.4	7,022.5
2003	0.2	24.7	166.3	241,649.8	241,840.9
2004	0.8	0.2	11,830.7	18,890.3	30,722.0
2005	0.7	31.3	156.8	58,786.2	58,974.9
2006	0.03	11.9	60.1	91,719.1	91,791.1
2007	0.16	12.9	25,304.7	492,579.3	517,897.0
2008	0.14	12.2	2,181.5	283,328.8	285,522.6
2009 *	0.02	0.5	4.7	1,001.4	1,006.6
Total 1990 to 2009	99.2	217.6	72,670.5	2,658,169.9	grand total 2,731,157.3

This data is from the Pennsylvania DEP and the MIMS – U.S. Department of Energy as of May 2010. Activity is in curies. * 2009 LLRW activity only includes burial at Energy Solutions in Clive, Utah. All other years include Barnwell, South Carolina, burial and Energy Solutions, Clive, Utah, burial.

CHART C-2



APPENDIX D

Appalachian States Low-Level Radioactive Waste Commission
Financial Statements

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

FINANCIAL STATEMENTS

YEARS ENDED JUNE 30, 2009 AND 2008

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CERTIFIED PUBLIC ACCOUNTANTS

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James E. Lyons
Howard R. Greenawalt
Deborah J. Kelly
Scott J. Christ

Creedon R. Hoffman

INDEPENDENT AUDITORS' REPORT

Commission Members
Appalachian States Low-Level
Radioactive Waste Commission
Harrisburg, Pennsylvania

We have audited the accompanying financial statements of the governmental activities and each major fund of Appalachian States Low-Level Radioactive Waste Commission as of and for the years ended June 30, 2009 and 2008, which collectively comprise the Commission's basic financial statements as listed in the table of contents. These financial statements are the responsibility of the Commission's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in Government Auditing Standards, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the accompanying financial statements present fairly, in all material respects, the respective financial position of the governmental activities and each major fund of Appalachian States Low-Level Radioactive Waste Commission as of June 30, 2009 and 2008 and the results of its activities for the years then ended in conformity with accounting principles generally accepted in the United States of America.

In accordance with Government Auditing Standards, we have also issued our report dated August 19, 2009 on our consideration of Appalachian States Low-Level Radioactive Waste Commission's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the internal control over financial reporting or compliance. That report is an integral part of an audit performed in accordance with Government Auditing Standards and should be considered in assessing the results of our audit.

400 West Main Street • Mechanicsburg, PA 17055 • 717.766.4763 • Fax 717.766.2731
62 West Pomfret Street • Carlisle, PA 17013 • 717.243.4822 • Fax 717.258.9372
www.greenawalt.cc

Management's discussion and analysis on pages MDA - 1 through MDA - 2 and budgetary comparison information on page RSI - 1 are not a required part of the financial statements but are supplementary information required by accounting principles generally accepted in the United States of America. We have applied certain limited procedures, which consisted principally of inquiries of management regarding the methods of measurement and presentation of the required supplementary information. However, we did not audit the information and express no opinion on it.

Greenawalt & Company, P.C.

GREENAWALT & COMPANY, P.C.

August 19, 2009

Mechanicsburg, Pennsylvania

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

MANAGEMENT'S DISCUSSION AND ANALYSIS

JUNE 30, 2009

The General Assembly of the Commonwealth of Pennsylvania created the Appalachian States Low-Level Radioactive Waste Commission (Commission) by enacting the Appalachian States Low-Level Radioactive Waste Compact Act, 1985-120. Under the authority of this act, the states of Delaware, Maryland, West Virginia and the Commonwealth of Pennsylvania formed a compact to provide for the regional management and disposal of Low-Level Radioactive Waste (LLRW). Congress consented to the Appalachian States Low-Level Radioactive Waste Compact in 1988.

The Commission consists of ten members; four members from Pennsylvania and two members from each of the other party states of Maryland, Delaware and West Virginia. The Commission members are appointed according to the laws of each party state. Each party state determined the length of term for which its Members and Alternates are appointed.

The Commission provides for representation of the compact party states throughout the siting process and LLRW disposal facility development and operations. Pennsylvania has been designated as the initial host state for the regional LLRW disposal facility because it generates the largest amount of LLRW in the compact.

In December of 1998, the Pennsylvania Department of Environmental Protection (DEP) suspended the LLRW siting process due to the current availability of out-of-state LLRW disposal facilities and the diminished volume of LLRW that would have been disposed of at the regional LLRW disposal facility in Pennsylvania. As a result, the Commission amended certain provisions of its bylaws to facilitate its continued operations without a business office and transferred the duties and responsibilities of the executive director to the chairman of the Commission. The Vice Chairman acts as secretary and treasurer of the Commission.

The Commission continues to incur certain expenditures, which are included in the Commission's budget. The budget is reviewed and approved by the Commission at its annual meeting. The Commission's annual expenditures presently exceed its annual interest income from the Operating fund. The Operating Fund accounts for the general operations of the Commission and is managed by the Pennsylvania Department of Treasury's INVEST Program. At the current level of expenditures, the Operating Fund would be adequate to provide for continued funding of the Commission's expenditures for a relatively long period of time. As of June 30, 2009 the Operating Fund had a fund balance of approximately $ 349,000. The Commission's actual expenditures for this period were approximately $ 30,000.

The Commission's annual budget is not expected to vary significantly in the foreseeable future. However, the interest income from the INVEST Program may vary due to economic conditions.

Article II of act 1985-120 allows the Commission to collect fees from the four compact party states for the purpose of continuing its duties and responsibilities. The Act requires that the payments by the party states be made directly to the Commission in quarterly installments during the fiscal year. In 1998, the Commission decided to suspend the collection of the fees due to the suspension of the LLRW siting process and the subsequent closure of its business office. However, the option continues to be available to the Commission should the need arise.

The Commission has appropriated a portion of its Operating Fund's fund balance in the amount of $ 200,000 in order to re-establish its business office expeditiously in the event the project would restart. It is unlikely that a restart of the siting process would occur in the foreseeable future as LLRW generators in the Appalachian Compact continue to have access to out-of-state disposal facilities. If the circumstances change, the Commission in conjunction with the host state of Pennsylvania may need to consider options for providing LLRW generators with access to a disposal facility. Those options may include, but are not limited to, restarting the siting process of providing for LLRW disposal capacity through contractual arrangements with other sites, states, or compacts.

The Commission is not presently involved in any litigation that would have a material adverse effect on the financial position of the Commission. Also, the Commission is tax exempt under the Internal Revenue Code and, accordingly, there is no provision for income taxes in the Commissions' financial statements.

As required by Article II of Act 1985-120 and Article VIII of the Commission Bylaws, the Commission prepares and publishes an annual report. The report summarizes the activities of the Commission during the preceding fiscal year, and includes the Independent Auditors' Report of the Commission's financial statements.

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

STATEMENTS OF NET ASSETS
JUNE 30, 2009 AND 2008

	2009	2008
Assets		
Cash	$ 13,244	$ 10,380
Investments	1,021,072	1,041,084
Total assets	$ 1,034,316	$ 1,051,464
Liabilities	$ -	$ -
Net assets		
Unappropriated	13,244	10,380
Appropriated	336,020	364,901
Restricted	685,052	676,183
Total net assets	1,034,316	1,051,464
Total liabilities and net assets	$ 1,034,316	$ 1,051,464

The accompanying notes are an integral part of these financial statements.

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

STATEMENTS OF ACTIVITIES
YEARS ENDED JUNE 30, 2009 AND 2008

	2009	2008
Direct expenses		
Legal services	$ 10,000	$ 10,000
Membership fee	8,500	7,500
Meeting expenses	6,497	1,674
Audit	2,200	2,070
Travel	1,983	2,528
Bank fees	-	(95)
Office supplies	204	227
Insurance	200	200
Advertising	1,052	586
	30,636	24,690
Revenue - Investment earnings	13,488	38,223
Change in net assets	(17,148)	13,533
Net assets - beginning of the year	1,051,464	1,037,931
Net assets - end of the year	$ 1,034,316	$ 1,051,464

The accompanying notes are an integral part of these financial statements.

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

STATEMENTS OF REVENUE, EXPENDITURES
AND CHANGES IN FUND BALANCES - GOVERNMENTAL FUNDS
YEAR ENDED JUNE 30, 2009

	Operating Fund	Surcharge Fund	Total
Revenue - Interest	$ 4,619	$ 8,869	$ 13,488
Expenditures			
Legal services	10,000	-	10,000
Membership fee	8,500	-	8,500
Meeting expenses	6,497	-	6,497
Audit	2,200	-	2,200
Travel	1,983	-	1,983
Bank fees	-	-	-
Office supplies	204	-	204
Insurance	200	-	200
Advertising	1,052	-	1,052
	30,636	-	30,636
Excess (deficiency) of revenues over expenditures	(26,017)	8,869	(17,148)
Fund balance - beginning of the year	375,281	676,183	1,051,464
Fund balance - ending of the year	$ 349,264	$ 685,052	$ 1,034,316

The accompanying notes are an integral part of these financial statements.

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

STATEMENTS OF REVENUE, EXPENDITURES
AND CHANGES IN FUND BALANCES - GOVERNMENTAL FUNDS (Cont'd.)
YEAR ENDED JUNE 30, 2008

	Operating Fund	Surcharge Fund	Total
Revenue - Interest	$ 13,611	$ 24,612	$ 38,223
Expenditures			
Legal services	10,000	-	10,000
Membership fee	7,500	-	7,500
Meeting expenses	1,674	-	1,674
Audit	2,070	-	2,070
Travel	2,528	-	2,528
Bank fees	(95)	-	(95)
Office supplies	227	-	227
Insurance	200	-	200
Advertising	586	-	586
	24,690	-	24,690
Excess (deficiency) of revenues over expenditures	(11,079)	24,612	13,533
Fund balance - beginning of the year	386,360	651,571	1,037,931
Fund balance - ending of the year	$ 375,281	$ 676,183	$ 1,051,464

The accompanying notes are an integral part of these financial statements.

REPORTING ENTITY

The Appalachian States Low-Level Radioactive Waste Commission was established to meet state responsibilities outlined in the federal Low-Level Radioactive Waste Policy Act of 1980 (P.L. 96-573) and the Low-Level Radioactive Waste Policy Amendments Act of 1985 (P.L. 99-240).

The reporting entity consists of all funds over which the Commission exercises oversight responsibility. Oversight responsibility is determined on the basis of financial interdependency, selection of governing authority, designation of management, ability to significantly influence operations and accountability for fiscal matters and scope of public service. The Commission is not a component unit of any of the Party States and is not included in any of the Party State's financial statements. Additionally, no other component units exist.

SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of presentation

Entity-wide financial statements (i.e., the statement of net assets and the statement of activities) report information on all activities of the Commission.

The statement of activities demonstrates the degree to which the direct expenses are offset by revenues.

Fund financial statements are also presented to show revenues and expenditures of each fund.

Fund accounting

The accounts of the Commission are organized on the basis of funds, each of which is considered a separate accounting entity. The operations of each fund are accounted for with a separate set of self-balancing accounts that comprise its assets, liabilities, fund balance, revenues, and expenses. Resources are allocated to and accounted for in individual funds based upon the purposes for which they are to be spent and the means by which spending activities are controlled. The Commission has the following funds:

Operating Fund - This fund accounts for the general operations of the Commission.

Surcharge Fund - This fund accounts for the surcharge payments received by the Commission.

Surcharge payments

Surcharge payments came from a disposal surcharge levied by the Federal government on generators of low-level waste. This surcharge was mandated by the 1985 Low-Level Radioactive Waste Policy Amendments Act. The surcharge was to serve as an incentive to regions and states to meet federally set milestones in the development of their own disposal facilities.

SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (Cont'd.)

Income tax

The Commission is exempt under the Internal Revenue Code and, accordingly, there is no provision for income taxes in the accompanying financial statements.

CASH AND INVESTMENTS

All of the Commission's cash deposits are FDIC insured up to $ 250,000. The Commission does not have a formal policy regarding cash deposits.

All of the Commission's investments are with the Pennsylvania Treasurer's INVEST Program. These amounts are invested directly in a Portfolio of securities which are held by third-party custodians. Since the INVEST Program acts in a fiduciary capacity for the Commission and recognizes the Commission as the pledgee of the collateral securities, these investments are considered to be held by the third-party custodians in the Commission's name.

APPROPRIATED NET ASSETS

The Commission has appropriated a portion of June 30 net assets as follows:

	2009	2008
Legal	$ 10,000	$ 10,000
Fiscal stabilization	126,020	154,901
Restart	200,000	200,000
	$ 336,020	$ 364,901

LEGAL SERVICES

Legal services are primarily to assist the Commission in fulfilling its activity as disclosed in the Reporting Entity Note. In the opinion of management, the Commission is not involved in any litigation that would have a material adverse effect on the financial position of the Commission.

APPALACHIAN STATES LOW-LEVEL RADIOACTIVE WASTE COMMISSION

BUDGETARY COMPARISON INFORMATION - OPERATING FUND
YEAR ENDED JUNE 30, 2009

	Actual	Original Budget	Variance Over (under) Budget
Revenue			
Interest	$ 4,619	$ 8,000	$ (3,381)
Expenditures			
Legal services	10,000	10,000	-
Membership fee	8,500	8,500	-
Meeting expenses	6,497	5,000	1,497
Audit	2,200	2,000	200
Travel	1,983	5,000	(3,017)
Bank fees	-	-	-
Office supplies	204	-	204
Insurance	200	200	-
Advertising	1,052	1,500	(448)
	30,636	32,200	(1,564)
Excess (deficiency) of revenues over expenditures	$ (26,017)	$ (24,200)	$ (1,817)

The accompanying notes are an integral part of these financial statements.

Glossary of Common Radioactive Waste Terms

Atomic Energy Act (AEA) - This 1954 act created the federal Atomic Energy Commission (AEC). The AEC later split into the Nuclear Regulatory Commission (NRC) and the Energy Research and Development Administration (ERDA). ERDA then became part of the U.S. Department of Energy in 1977. This act encouraged the development and use of nuclear energy and research for the general welfare and the common defense and security of the United States. It is the basis of authority for the NRC, the DOE and the U.S. Environmental Protection Agency (EPA) in regulating radioactive materials defined in the AEA. NARM is not defined under this act and therefore is not subject to its requirements. (See Glossary entry for "NARM.")

By-product Material - There are basically three types of by-product materials: (1) Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure incident to the process of producing or utilizing special nuclear material; (2) The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "by-product material" within this definition, and (3) The Energy Policy Act in 2005 added discrete Ra-226 sources to the by-product definition. Also included is any other naturally occurring radioactive material made into a discrete source that would pose a similar hazard to a Ra-226 discrete source.

CERCLA (Superfund) - Passed in 1980, the Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund) addresses immediate and long-term threats to the public's health and the environment from abandoned or active sites contaminated with hazardous or radioactive materials. Under the Superfund program, EPA has the authority to clean up the nation's worst hazardous waste sites using money from a trust fund supported primarily from a tax on chemical feed stocks used by manufacturers. Companies or individuals responsible for the wastes are identified by EPA, if possible, and made to pay for the cleanups. The Superfund Amendments and Reauthorization Act (SARA) of 1986 authorized CERCLA to continue cleanup activities around the country. Several site-specific amendments, definitions, clarifications and technical requirements were added to the legislation, including additional enforcement authorities. Title III of SARA also authorized the Emergency Planning and Community Right-to-Know Act (EPCRA).

CFR - Code of Federal Regulations.

Curie (Ci) - Radioactive atoms are unstable and break down by disintegrating into other atoms. A curie is the unit of radioactivity equal to 3.7×10^{10} disintegrations per second or 3.7×10^{10} becquerel (Bq). A common unit used in environmental measurements is the picocurie (pCi), which is equal to 10^{-12} Ci or 0.037 disintegrations per second or 0.037 Bq.

Department of Energy (DOE) - This federal agency's mission is to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality and a secure national defense. DOE was created on Oct. 1, 1977, out of the Energy Research and Development Agency, as well as various aspects of non-nuclear federal energy policy and programs. The DOE complex, which is located across 22 states, produced and tested nuclear weapons. For more information, visit DOE’s Web site at www.doe.gov.

Environmental Protection Agency (EPA) - Created in 1970, the federal EPA is responsible for working with state and local governments to control and prevent pollution in areas of solid and hazardous waste, pesticides, water, air, drinking water and toxic and radioactive substances.

Federal Facilities Compliance Act (FFCA or FFCAct) - An amendment to RCRA, the FFCA waives immunity for DOE and other federal agencies, allowing states and the EPA to impose penalties for non-compliance, and requires DOE to develop plans for treating the hazardous components of radioactive wastes subject to RCRA requirements.

Half-Life - The half-life of a radioactive material is the time it takes for half of the material to radiate energetic particles and rays and transform to new materials. For example, the half-life of cesium (Cs-137) is 30 years, after which time half of it decays to a non-radioactive stable nuclide, barium (Ba-137). If one starts with 100 Kg of Cs-137, 50 Kg of Cs-137 remain after 30 years.

Hazardous Waste - A subset of solid wastes that pose substantial or potential threats to public health or the environment and meet any of the following criteria identified in 40 CFR 260 and 261:

- Is specifically listed as a hazardous waste by EPA;
- Exhibits one or more of the characteristics of hazardous waste (ignitability, corrosivity, reactivity and/or toxicity); or
- Is generated by the treatment of hazardous waste or is contained in a hazardous waste.

Hazardous and Solid Waste Amendments (HSWA) - This 1984 act amended RCRA and required the phasing out of land disposal of untreated hazardous waste by more stringent hazardous-waste management standards (broken down into thirds with a timetable for each third). Some of the other mandates of this law include increased enforcement authority for EPA and a program requiring corrective action.

High-Level Radioactive Waste (HLW) - The radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly from reprocessing and any solid waste derived from the liquid that contains a combination of transuranic and fission product nuclides in quantities that require permanent isolation. HLW is also a mixed waste because it has highly corrosive components or has organics or heavy metals that are regulated under RCRA. HLW may include other highly radioactive material that NRC determines by rule, consistent with existing law, requires permanent isolation.

Heavy Metal (RCRA Metals) - This is a common hazardous waste that can damage organisms at low concentrations and tends to accumulate in the food chain. Examples are lead, chromium, cadmium and mercury.

Land Disposal Restrictions (LDR) - These restrictions were mandated by the 1984 HSWA amendments to RCRA. They prohibit the disposal of hazardous wastes into or on the land unless the waste meets treatability standards of lower toxicity.

Liquid Scintillation Cocktail (LSC) - A common fluid used in medical laboratories to analyze DNA and proteins. It often uses radioactive tracers and RCRA-listed hazardous materials, such as Toluene and Xylene. The combinations of the two make it a mixed waste. By volume, it is

the most common form of commercially generated (non-DOE) mixed waste (71 percent in a 1990 national study).

Low-Level Mixed Waste (LLMW) - LLMW is waste that contains LLRW and hazardous waste.

Low-Level Radioactive Waste (LLRW or LLW) - LLRW is waste that satisfies the definition of LLRW in the Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA) of 1985. The LLRWPAA defines LLRW as "radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel or byproduct material as defined in Section 11e.2 of the Atomic Energy Act of 1954 and; (B) which the NRC, consistent with existing law and in accordance with paragraph (A), classifies as low-level radioactive waste."

Mixed Transuranic Waste (MTRU) - MTRU contains both transuranic (TRU) and hazardous wastes. Approximately 55 percent of DOE's TRU is MTRU.

Mixed Waste (MW) - MW contains both hazardous waste (as defined by RCRA and its amendments) and radioactive waste (as defined by AEA and its amendments). The NRC or the NRC's Agreement States and EPA or EPA's RCRA Authorized States jointly regulate mixed waste. The fundamental and most comprehensive statutory definition is found in the Federal Facilities Compliance Act (FFCA), where Section 1004(41) was added to RCRA: "The term 'mixed waste' means waste that contains both hazardous waste and source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954."

Naturally Occurring or Accelerator-Produced Radioactive Materials (NARM) - Radioactive materials not covered under the AEA that are naturally occurring or produced by an accelerator. Accelerators are used in sub-atomic particle physics research. These materials have been traditionally regulated by the states. A subset of NARM is NORM. NARM waste with more than 2 nCi/g of 226Ra or equivalent is commonly referred to as discrete NARM waste; below this threshold, the waste is referred to as diffuse NARM waste. Naturally occurring radionuclides made into sources (discrete NARM) may be classified as by-product material under the Energy Policy Act of 2005.

NORM - Naturally occurring radioactive material is a radioisotope that is radioactive in its natural physical state, not man-made, but does not include source or special nuclear material.

Nuclear Regulatory Commission (NRC) - NRC is an independent regulatory agency created out of the Atomic Energy Commission in 1975 to regulate the civilian uses of nuclear material. Specifically, the NRC is responsible for ensuring that activities associated with the operation of nuclear power plants and fuel cycle plants, and medical, industrial, and research applications are carried out with adequate protection of the public health and safety, environment and national security. At full complement, the NRC has five Commissioners nominated by the President and confirmed by the Senate. The President designates one of the Commissioners as Chairman. NRC regulates all commercial AEA materials. Except in a few cases, NRC does not regulate DOE. NRC does not regulate NARM. This site (http://www.nrc.gov) will link you to NRC's Home Page.

Resource Conservation and Recovery Act (RCRA) - RCRA gave EPA authority to control hazardous waste from "cradle-to-grave." This includes the minimization, generation, transportation, treatment, storage and disposal of hazardous waste. RCRA also set forth a

framework for the management of non-hazardous solid wastes. RCRA focuses only on active and future facilities and does not address abandoned or historical sites (see CERCLA).

Rad (Radiation Absorbed Dose) - One rad is defined as the absorption of 100 ergs per gram of material. The unit rad can be used for any type of radiation. The rad is a unit used to measure a quantity called absorbed dose. This relates to the amount of energy actually absorbed in some material and is used for any type of radiation and any material.

Radiation - Ionizing radiation is comprised of highly energetic and penetrating x-rays and gamma rays and lesser penetrating particles. Beta particles are simply energetic electrons, and alpha particles are helium nuclei both arising from the nucleus of a decaying atom. The alpha particle is the easiest of these radiations to stop, and the gamma rays are the most difficult to shield against. A piece of paper can stop an alpha particle, but it may take as much as many inches of lead shielding to stop most of the x-rays or gamma rays in a beam. Depending on the dose, kind of radiation and observed endpoint, the biological effects of radiation can differ widely. Ionizing radiation has been proven to cause cancer at high doses and is assumed to cause cancer and other deleterious health effects at low doses.

Rem (Roentgen Equivalent Man) - The rem is a unit used to derive a quantity called equivalent dose. This relates the absorbed dose in human tissue to the effective biological damage of the radiation. Equivalent dose is often expressed in terms of thousandths of a rem or mrem.

Solid Waste - As defined under RCRA, any solid, semi-solid, liquid or contained gaseous materials discarded from industrial, commercial, mining, agricultural operations and from community activities. Solid waste includes garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants or air pollution control facilities and other discarded materials. Solid waste does not include solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Clean Water Act or source, special nuclear or byproduct material as defined by the AEA.

Source Material - Source material is the uranium or thorium ores mined from the earth. Source material is defined in 10 CFR 20.1003 as “(1) Uranium or thorium or any combination of uranium and thorium in any physical or chemical form; or (2) Ores that contain, by weight, one-twentieth of 1 percent (0.05 percent) or more of uranium, thorium, or any combination of uranium and thorium. Source material does not include special nuclear material."

Special Nuclear Material (SNM) - SNM is defined in 10 CFR 20.1003 as "(1) Plutonium, uranium-233, uranium enriched in the isotope 233 or in isotope 235, and any other material that the NRC, pursuant to the provisions of Section 51 of the AEA, determines to be SNM, but does not include source material; (2) or any material artificially enriched by any of the foregoing but does not include source material." SNM is important in the fabrication of weapons grade materials and as such has strict licensing and handling controls.

Specific Activity – The amount of radioactivity per unit weight or volume.

Spent Nuclear Fuel (SNF) - Fuel is withdrawn from a nuclear reactor following irradiation and has undergone at least one year's decay since being used as a source of energy in a power reactor. SNF has not been chemically separated from its constituent elements by reprocessing. SNF includes the special nuclear material, byproduct material, source material, and other radioactive materials associated with fuel assemblies. See 10 CFR 72.3 for more details.

Superfund - See "CERCLA."

Storage-in-Decay - Radioactive elements will break down and yield energetic gamma rays, x-rays and particles. After enough time has elapsed (usually ten half-lives) the material has decayed to a point where a radiation survey meter cannot distinguish between it and natural background radiation levels.

TENORM - Technologically enhanced naturally occurring radioactive materials. It is naturally occurring radioactive material not specifically subject to regulation under the laws of the Commonwealth or Atomic Energy Act (Public Law 83-703, 68 Stat. 921, 42 U.S.C. §2011 et seq.), but whose radionuclide concentrations or potential for human exposure have been increased above levels encountered in the undisturbed natural environment by human activities.

Transuranic Radioactive Waste (TRU) - TRU waste contains more than 100 nanocuries of alpha-emitting transuranic isotopes with half-lives greater than 20 years, per gram of waste except for (1) high-level radioactive waste; (2) wastes that DOE has determined, with the concurrence of EPA, do not need the degree of isolation required by EPA's high-level waste rule (40 CFR 191); or (3) waste that has been approved for disposal on a case-by-case basis in accordance with NRC's radioactive land disposal regulation (10 CFR Part 61). TRU is not generally found outside the DOE complex and is mainly produced from the reprocessing of spent nuclear fuel, nuclear weapons production and reactor fuel assembly. TRU wastes mainly emit alpha particles as they break down. DOE is currently proceeding with plans for TRU waste disposal at a geologic repository called the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. DOE categorizes TRU as either contact handled (CH) or remote handled (RH) with RH being the more radioactive of the two.

Vitrification - Vitrification is the process of converting materials into a glass-like substance, typically through a thermal process. Radionuclides and other inorganics are chemically bonded in the glass matrix. Consequently, vitrified materials generally perform very well in leach tests. EPA has specified, under the land disposal restrictions, vitrification to be the treatment technology for high-level waste (55 FR 22627, June 1, 1990).

Waste Isolation Pilot Plant (WIPP) -The WIPP, which is managed by the Department of Energy (DOE), is a geologic disposal facility for TRU radioactive waste generated as by-products from DOE's nuclear weapons production. The WIPP is located underground in excavated, natural salt formations near Carlsbad, New Mexico.

Yucca Mountain - Located in Nevada, Yucca Mountain is being characterized as a potential geologic repository for high-level waste, spent nuclear fuel and possibly for waste that is defined as greater-than-Class C. A key element of permanent disposal is that it must be able to isolate highly radioactive waste for thousands of years because its radioactivity can harm people and the environment. According to the 1992 Energy Policy Act, EPA is to set generally applicable standards based upon public health and safety standards and be consistent with the findings and recommendations of the National Academy of Sciences for the protection of the public from releases from radioactive materials stored or disposed in the repository at the Yucca Mountain site.

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