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South Carolina Department of Health and
Environmental Control (DHEC)
Division of Radioactive Waste Management

Status of the Barnwell
Low-Level Radioactive Waste Disposal Site
January 2000

History

The Barnwell Low-Level Radioactive Waste Disposal Facility is located approximately five (5) miles northwest of Barnwell adjacent to the Savannah River Site and the former Barnwell Fuel Recycling Plant. It encompasses an area of approximately 278 acres. Of this 235 acres are deeded to the state and leased to Chem-Nuclear Systems for operation of the disposal facility. The lease expires in 2075.

The facility is one of three licensed commercial disposal facilities operating in the United States. The other two facilities are the Hanford Commercial Facility operated by U.S. Ecology and the Clive, Utah site operated by Envirocare. The Barnwell Facility has been operated by Chem-Nuclear Systems, LLC. (CNS) since it began receiving waste for disposal in 1971. The facility is licensed by the Department of Health and Environmental Control. All regulatory activities are funded through fees collected by DHEC. The license expires on July 31, 2000 and can be renewed. DHEC also permits all generators who transport waste into or within the state, and has a very effective enforcement program.

Under the current state law, the facility is allowed to accept waste from generators in all states with the exception of North Carolina. From June 30, 1994 to June 30, 1995, the facility accepted waste only from generators in the eight states that comprised the Southeast Compact. The volume of waste received during that period was 312,325.06 cubic feet. Prior to June 30, 1994, the facility was open to generators in all states and received approximately seventy-five percent of the commercial low-level radioactive waste generated throughout the country (800,000 cubic feet per year). The facility received 166,435.79 cubic feet of waste in 1999.

Regulatory Changes

During 1995, changes were made to Regulation 61-63 (Title A) Radioactive Materials affecting the disposal of low-level waste at the Barnwell site. These changes required that the technology that would be used at the proposed new regional disposal facilities will be used at the Barnwell Facility. The regulatory changes included requirements for placing all waste in engineered barriers (concrete vaults) and the use of an improved leachate collection and monitoring system for the disposal cells (trenches). The methods to meet these regulatory changes were developed by CNS and have been approved by DHEC.

All waste received after December 31, 1995, has been placed in the concrete vaults with the exception of large objects which can, through an engineering evaluation, be shown to be structurally stable. The Department

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reviews these on a case-by-case basis. The vaults are placed below ground in engineered trenches and the waste is placed in the vaults. The waste is processed to be a dry solid, and is packaged prior to being shipped for disposal. When the trench is filled it is covered with a multi- layer cap to prevent percolation of water through the waste.

The facility meets or exceeds all state and federal regulatory requirements. Radiological exposure to site workers have been minimal, and no evidence of increased exposure to the general public has occurred due to site operations or the transportation of waste.

Environmental Monitoring

The site is monitored by both DHEC and CNS to ensure that it meets all state and federal requirements. This includes collecting and analyzing over 100 water samples from monitoring wells both on and off site, air samples, soil samples, and vegetation. The only radionuclide that has been detected by the environmental monitoring program is tritium, a radioactive form of hydrogen, which has migrated from some of the oldest disposal trenches. The state Budget and Control Board approved expenditures for the placement of multi-layer caps over these trenches to reduce the infiltration migration of the tritium. This has been a very successful program.

Tax Revenues

During the 1995 session of General Assembly Section 48-48-80 and Section 48-48-140 of The 1976 Code of Laws were amended allowing the Barnwell site to remain open after 1995 and placing a $235 per cubic foot tax on all waste received at the site. From July 1995 through June 1999, the site has received 1,095,533.48 cubic feet of waste and the state collected approximately $257 million in taxes on this waste under the new low-level radioactive waste tax. Additional taxes have been paid by CNS to makeup scholarship shortfalls. They are required to pay $ 24 million in taxes for scholarships regardless of the volume of waste they receive.

State Generators

There are fifteen (15) facilities in the state that generated large quantities (greater than 75 cubic feet) of low-level radioactive waste in 1999. These includes four (4) nuclear power plants, six (6) industrial facilities, two (3) research facilities (USC, Clemson University and MUSC), and two (2) facilities undergoing decommissioning. Twenty-four (24) additional facilities disposed of small quantities (less that 75 cubic feet) of waste in 1999. Facilities that generated more than 75 cubic feet of radioactive waste in the state and their locations are provided in Attachment I. Table I is a breakdown of waste received by generator category.

Table I LLW Breakdown by Waste Generator Category* For Waste Disposed at Barnwell 1999				
Category	National Cubic Feet	National Percent	South Carolina Cubic Feet	SC Percent
Utility	124,335.427	74.7%	3,181.939	75.1%
Government (Department of Defense)	13,891.589	8.3%	23.439	0.6%
University	3,598.527	2.2%	175.114	4.1%
Hospitals	918.310	0.6%	0.65	<0.1%
Industries	23,691.937	14.2%	854.633	20.2%
Total	166,435.790	100%	4,235.775	100%

*Does not account for waste shipped to Envirocare, Utah
**For 1999 South Carolina accounted for 2.5% of the national volume disposed at Barnwell.
***For the past five years, South Carolina accounted for 8.4% of the national volume disposed at Barnwell.

Volumes & Capacity

Volumes of waste disposed of at the Barnwell site have decreased steadily over the past 5 years (see graph, Figure I). This decrease is due to the increased used of volume reduction techniques for the large volume waste streams and the disposal of bulk low-activity waste at the Envirocare Facility. This trend is expected to continue. However, the activity or amount of radioactive material in the waste is not expected to decrease and may increase due to the aging of the country's nuclear reactors. With volume reduction, the concentrations of radionuclides in the waste will increase. Table II shows the volumes of waste received since 1992 along with the total activity of the waste. Table III shows the monthly volumes and activities of waste received during 1999 and Attachment II shows the volumes of waste for 1999 received from each state. Table IV shows the volumes and activities of waste received since the site began receiving waste in 1971. It should be noted that the activity is not evenly disbursed throughout the volume of the waste. The total volume of waste disposed of through December 1999 is 27,658,276.974 cubic feet.

The estimated remaining capacity of the site is 3 million cubic feet. Based on estimated waste receipts, the site could continue to operate for an additional five (5) to ten (10) years.

Table II Annual Volumes & Activities of Waste at the Barnwell Site			
Year	Volume (cubic feet)	South Carolina Volume (cubic Feet)	Total Activity (curies)
1992	828,720.34	45,656.90	815,944.28325
1993	605,443.07	35,446.02	611,784.73150
1994	733,931.04	54,543.70	735,298.41375
1995	484,544.32	86,744.73	168,982.13010
1996	325,870.60	10,238.10	445,471.36289
1997	222,269.48	5,452.04	102,624.48390
1998	195,684.083	10,898.252	356,205.45577
1999	166,435.79	4,235.775	327,011.64090

Table III Monthly Volumes & Activities of Waste at the Barnwell Site 1999			
Month	National Volume (cubic feet)	Comparable South Carolina Volume (cu.ft.)	Total Activity (curies)
January	11,343.000	313.906	35,428.06161204
February	8,484.860	446.049	20,748.35022587
March	15,841.380	714.643	18,904.97990641
April	9,332.040	318.474	15,548.95266575
May	17,079.990	179.654	46,429.06079728
June	17,396.730	52.656	18,356.03001735
July	20,300.020	243.222	34,902.45170372
August	17,004.190	353.692	15,682.97501721
September	9,500.620	196.770	13,193.69119131
October	10,327.540	284.143	6,932.67976828
November	14,008.560	190.666	38,262.12412005
December	15,816.860	941.900	62,622.20587967
Total	166,435.790	4,235.775	327,011.64090

Table IV Barnwell Burial Volumes and Activities		
Year	Volume (cubic feet)	Activity (curies)
1971	50,219.34	212,412.03
1972	159,933.47	19,787.38836
1973	599,886.28	52,650.96936
1974	624,759.55	22,103.10092
1975	643,564.44	19,418.67887
1976	1,393,587.55	89,911.80482
1977	1,636,425.12	395,713.75544
1978	2,220,519.72	636,857.81950
1979	2,238,322.13	314,938.44131
1980	2,444,810.72	143,495.35994
1981	1,543,287.67	183,744.31021
1982	1,228,200.83	273,961.55521
1983	1,240,668.21	383,450.24518
1984	1,231,715.28	385,079.06727
1985	1,214,422.99	460,600.24656
1986	1,053,791.68	116,108.00594
1987	958,275.82	211,098.06858
1988	931,974.01	219,033.83473
1989	1,103,299.56	725,163.57030
1990	788,031.90	443,594.19325
1991	789,681.85	611,535.76123
1992	828,720.34	815,944.28325
1993	605,443.07	611,784.73150
1994	733,931.04	735,298.41375
1995	484,544.32	168,982.1301
1996	325,870.60	445,471.36289
1997	222,269.48	102,624.48390
1998	195,684.214	356,205.45577
1999	166,435.79	327,011.6409
Total	27,658,276.974	9,483,980.70904

The current inventory of radionuclides at the site is 2,664,081.35 due to radioactive decay.

Compacts

There are currently ten (10) Low-level Waste Compact that have been established under the Low-Level Radioactive Waste Policy Amendments Act of 1985. Very little progress if any has been made by the compacts in developing new sites. The Texas Compact, which includes Texas, Maine and Vermont has been ratified by the U.S. Congress. Siting activities have been suspended in Pennsylvania, Ohio, New Jersey, Massachusetts, New York, and North Carolina. No siting activities have been conducted for District of Columbia, New Hampshire, Puerto Rico, or Rhode Island. A license has been issued by California for a site, however, the U.S. Department of the Interior has refused to transfer the land. Two administrative law judges have recommended denying the application for the Texas site. The license for the Nebraska site has been denied and litigation is pending by the utilities. Illinois is developing their siting process but has made very little progress.

The South Carolina Nuclear Waste Task Force established by Governor Hodges has recommended that South Carolina join the Northeast Compact which currently includes the states of Connecticut and New Jersey. The compact would be renamed the Atlantic Compact. Bills will be introduced in the General Assembly to change state law for South Carolina to join the compact. The bills will likely include provisions for a rampdown of waste from outside of the compact over the next 3 to 5 years.

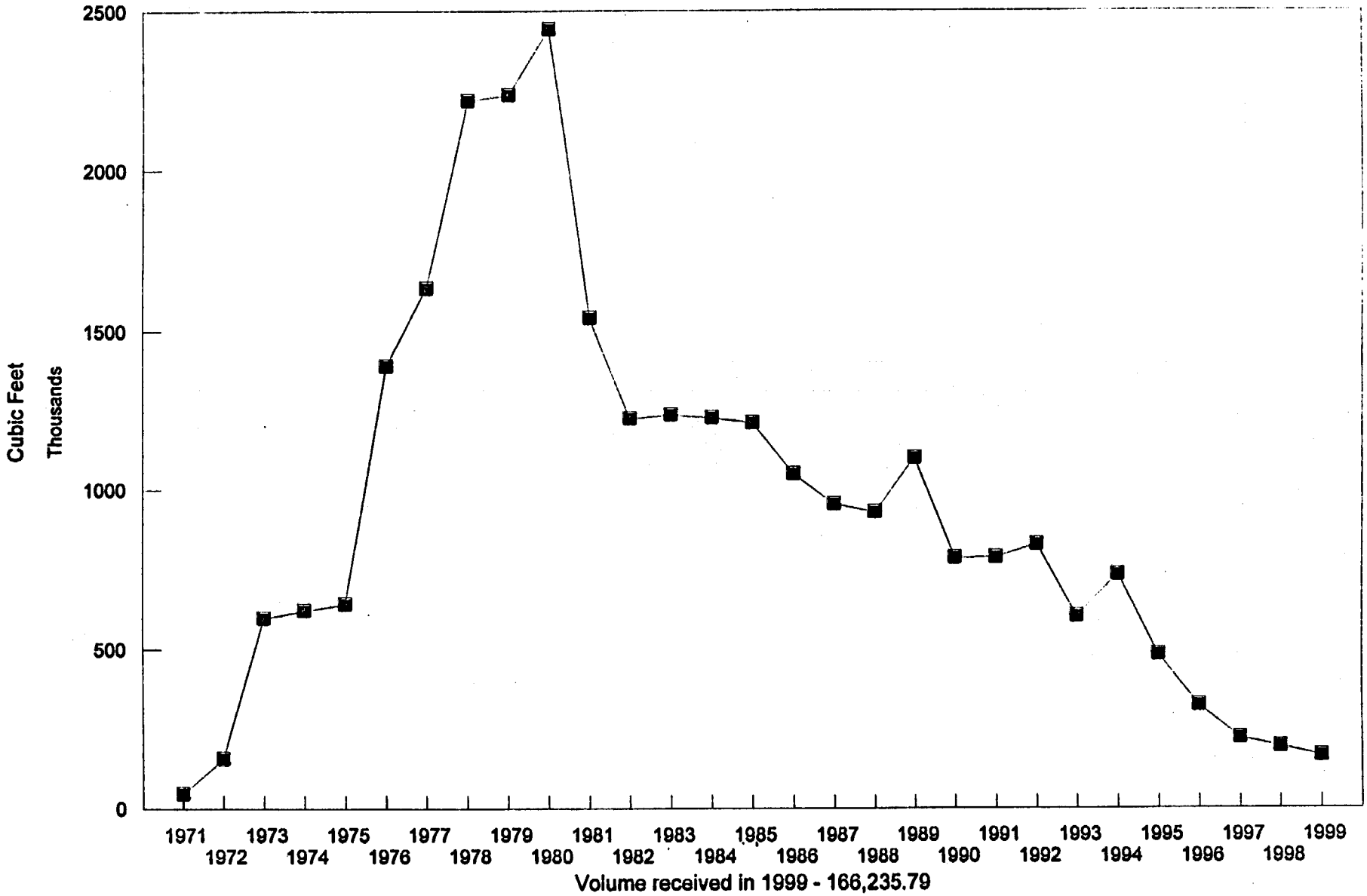
Attachment I

Major Generators in South Carolina that Shipped Waste to Barnwell in 1998

Facility	City
Allied General Nuclear Services	Barnwell
Chem-Nuclear Systems, LLC.	Barnwell
Starmet CMI (Carolina Metals, Inc.)	Barnwell
Medical University of South Carolina	Charleston
Clemson University	Clemson
Westinghouse Electric Corp.(Nuclear Fuels)	Columbia
INS Corp. (Nuclear Laundry)	Columbia
University of South Carolina	Columbia
Molten Metals Technologies Inc.	Columbia
Carolina Power & Light Co.	Hartsville
South Carolina Electric & Gas Co.	Jenkinsville
CVNPA Parr Reactor (Decommissioned)	Jenkinsville
Duke Power (Oconee)	Seneca
Westinghouse Electric Corp.(Technical Center)	Spartanburg
Duke Power (Catwaba)	York

BARNWELL DISPOSAL FACILITY

VOLUME (CUBIC FEET)



Volume received in 1999 - 166,235.79

Reference Summary
Chem-Nuclear Systems, LLC.
Low-Level Radioactive Waste Disposal Facility
January 2000
Department of Health and Environmental Control

- 1969 - License application submitted by Chem-Nuclear to store radioactive waste

- April 21, 1971 - Chem-Nuclear entered into a 99 year lease agreement with the South Carolina Budget and Control Board to lease a 17.2 acre plot of land, previously deeded to the state by Chem-Nuclear, for the purpose of burial of radioactive waste. April 6, 1976 - Lease agreement amended expanding the leased area to its present 235 acres. Lease expires 2075.

- 1971 - License amended to allow disposal of radioactive waste The license has been renewed seven times in 1972, 1975, 1978, 1981, 1984, 1987, and 1995. Current license expires July 2000.

- 1980 - Annual volume reaches 2.4 million cubic feet

- 1981 - Annual volume restricted to 1.2 million cubic feet by DHEC and Governor Riley.

- June 1994 - Site closes to all but Southeast states July 1995 - reopens to all but North Carolina

- January 1996 - **Disposal technology changed from shallow land disposal to engineered below grade vaults for all classes of waste. Four phases (70 acres) of site closure completed with the installation of impermeable, synthetic trench caps.**

- The total volume of waste disposed of through December 1999 is 27,658,276.97 cubic feet. (Table I)

- The total radioactivity disposed of through December 1999 is 9.5 million curies. The remaining radioactivity at the site is 2.7 million curies due to radioactive decay (approximately 1/3 of the disposed radioactivity).

- The site occupies an area of 235 acres. 99.4 acres have been used for disposal, 34.7 acres are available for disposal, and 100.9 acres are used for administrative control.

- Remaining capacity of the site is approximately 3.0 million cubic feet.

- Thru June 1999, deposits of $289 million for education tax from waste receipts, over $90 million for long term care fund, $15 million for closure fund, and in excess of $200 million 3rd party liability maintained.

- July 1999 - Governor Hodges establishes the 13 member South Carolina Nuclear Waste Task Force to make recommendations on the management of the state's low-level radioactive waste.

- December 1999 - Task Force finalizes report to Governor Hodges with the preferred option of South Carolina joining the Northeast Compact states of New Jersey and Connecticut to form the Atlantic Compact. Attachment I provides a summary of the waste volumes and generators from these states.

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Table I
Barnwell Burial Volumes and Activities

Year	Volume (cubic feet)	Disposed Activity (curies)[1]
1971	50,219.34	212,412.03
1972	159,933.47	19,787.38836
1973	599,886.28	52,650.96936
1974	624,759.55	22,103.10092
1975	643,564.44	19,418.67887
1976	1,393,587.55	89,911.80482
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1995	484,994.32	168,982.1301
1996	325,870.60	445,471.36289
1997	222,269.48	102,624.48390
1998	195,684.084	356,205.45577
1999	166,435.790	327,011.64090
Total	27,658,275.974	9,483,980.970904[1]

[1] Total manifested activity of radionuclides in waste.

Attachment I

EVALUATION OF WASTE FROM PROPOSED ATLANTIC COMPACT STATES

In July 1999, Governor Hodges formed the South Carolina Nuclear Waste Task Force to look at options for South Carolina to manage commercial low-level radioactive waste. In December 1999, the Task Force finalized their report to the Governor which included the preferred option of South Carolina joining the existing Northeast Compact. The compact would change its name to the Atlantic Compact. The Northeast Compact currently has two (2) member states, Connecticut and New Jersey.

Connecticut and New Jersey sent 3455.836 cubic feet and 8464.498 cubic feet respectively to the Barnwell Low-Level Radioactive Waste Facility in 1998, and 2235.591 cubic feet and 4323.455 cubic feet in 1999. South Carolina generators sent 10,898.252 cubic feet of waste in 1998 and 4235.775 cubic feet in 1999. Connecticut has eight (8) major generators (more than 75 cubic feet) which included two (2) nuclear power plants (one is currently being decommissioned), two (2) pharmaceutical research companies, two (2) manufacturing companies and two (2) universities. New Jersey has 13 major generators which include two (2) nuclear power plants, six (6) pharmaceutical research companies, three (3) manufacturing companies, one (1) environmental laboratory and one (1) university.

The Tables below shows the waste generated by each of the states for 1998 and 1999.

1998 Volumes by Waste Class				
State	Class A	Class B	Class C	Total
Connecticut	2728.266	306.5	421.07	3455.836
New Jersey	7336.851	921.75	205.897	8464.498
South Carolina	9018.792	768.15	1111.31	10,898.252
Total	19,083.909	1996.4	1738.277	22,818.586

1999 Volumes by Waste Class				
State	Class A	Class B	Class C	Total
Connecticut	1258.108	1.18	976.303	2235.591
New Jersey	3208.263	770.64	344.552	4323.455
South Carolina	2780.671	858.77	596.334	4235.775
Total	7247.042	1630.59	1917.189	10,794.821

The total volume received at Barnwell was 195,684.084 in 1998 and was 166,430.390 in 1999. The proposed compact states generated approximately 12% of the total volume for 1998 and 6.5% of the total in 1999.