

**SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL  
RADIOACTIVE MATERIAL LICENSE**

Pursuant to the Atomic Energy and Radiation Control Act, Section 13-7-40 et. seq. of S.C. Code of Laws of 1976 as amended and Supplements thereto, and the South Carolina Department of Health and Environmental Control Regulation 61-63 Radioactive Material (Title A), and in reliance on statements and representations heretofore made by the applicant, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer radioactive material listed below; and to use such radioactive material for the purpose(s) and at the place(s) designated below. The license is subject to all applicable rules of the South Carolina Department of Health and Environmental Control now or hereafter in effect and to any conditions specified below.

Amendment No. 47 amends

<p>LICENSEE</p> <p>1. Name      Chem-Nuclear Systems, LLC.               Barnwell Waste Management               Facility               A Subsidiary of Waste               Management, Inc.</p> <p>2. Address    P.O. Box 726               Barnwell, S.C. 29812</p>	<p>3. License Number</p> <p style="text-align: center;">097 in its entirety</p> <hr/> <p>4. Expiration Date</p> <p style="text-align: center;">July 31, 2000</p>	
<p>5. Radioactive Material (Element and Mass Number)</p> <p>A. Any Radioactive material excluding source material and special nuclear material.</p> <p>B. Source material</p> <p>C. Special Nuclear Material</p>	<p>6. Chemical and/or Physical Form</p> <p>A. Dry packaged radioactive waste except as authorized in this license.</p> <p>B. Dry packaged radioactive waste except as authorized in this license.</p> <p>C. Dry packaged radioactive waste except as authorized in this license.</p>	<p>7. Maximum Radioactivity and/or quantity of material which licensee may possess at any one time.</p> <p>A. 50,000 curies</p> <p>B. 60,000 pounds</p> <p>C. 350 grams total of <sup>235</sup>U or 200 grams <sup>233</sup>U or 200 grams of plutonium or any combination of these provided the sum of the ratios of the quantities does not exceed unity.</p>

**8. Authorized Use:**

A., B. and C.

Radioactive material as low-level radioactive waste may be received, stored, and disposed of by shallow land burial. The licensee shall not receive an annual volume of more than one million, two hundred thousand (1.2 million) cubic feet of waste per calendar year; however, the licensee is authorized to increase the volume in ten (10) per centum increments; provided that the Department is notified in writing no later than thirty (30) days in advance of such increases.

Unless otherwise authorized by the Department, only radioactive waste consigned for burial shall be received at the location specified in Condition No. 9 of this license. The maximum radioactivity and/or quantity of radioactive material indicated in Item 7. A, B, and C applies to the above ground activities.

General Conditions

9. Unless otherwise specified, the authorized place of use is a site located approximately five miles northwest of Barnwell, South Carolina, in the Seven Pines School District, Red Oak Township, Barnwell County, South Carolina within the boundary of the land area described in Lease agreement dated April 6, 1976, as amended.
10. The licensee shall comply with the provisions of Department Regulation 61-63, Radioactive Material, (Title A), Part I - General Provisions; Part II - Licensing of Radioactive Materials; Part III - Standards for Protection Against Radiation; Part VI - Notices, Instructions, and Reports to Workers; Inspections, and Part VII - Licensing Requirements for Land Disposal of Radioactive Waste; Department Regulation 61-83, Transportation of Radioactive Waste Into or Within South Carolina.
11. Unless otherwise specified in this license, the licensee shall make no changes in the internal safety audits, Safety Review Board, ALARA Review Committee, Site Criteria, or Procedures governing these specific activities without approval from the Department.
12. Operations authorized by this license shall be conducted in accordance with Chem-Nuclear Systems, Inc. procedures and subsequent revisions and additions approved by the Department. However, the licensee may upon notification to the Department but without Department approval, make minor changes to these procedures provided that:
  - A. The change does not affect requirements of any other license condition in this license;
  - B. The change does not increase the potential for personnel exposure;
  - C. The change does not diminish operational safety;
  - D. The change does not increase the potential for release of radioactive material to unrestricted areas; and
  - E. The change does not reduce the licensee's record keeping and reporting system.

The licensee shall maintain records of these changes including evaluations which provide the basis for the change.
13. The licensee shall ensure that all site personnel have satisfactorily completed the training program requirements as specified in the Chem-Nuclear Systems, Inc. Barnwell Site Training Program. Changes and additions to the program shall be submitted to the Department for review. Time intervals for personnel indoctrination, training, examinations, certification, retraining specified in Procedure S20-AD-004, "Barnwell Radioactive Waste Burial Site Personnel Training" shall not be changed without Department approval.
14. Operations shall be conducted by or under the supervision of: Mark S. Whittaker, (RPO), James W. Latham, Joseph J. Still, William B. House, Michael J. Benjamin, Ronald E. Versailles, or other individuals designated by the licensee's Radiation Protection Officer upon successful completion of the licensee's training program and approval by the licensee's Safety Review Board.
15. The licensee shall to the extent necessary, continue the employment of all personnel involved in the operation of the Barnwell Waste Management Facility in accordance with all requirements in the license and applicable

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regulations and, in the event replacement of employees becomes necessary, only individuals of comparable qualifications and experience will be hired.

16. A documented weekly inspection of site operations and the restricted area of the site for compliance with applicable conditions of this license shall be conducted by a named designee in Condition 14 or an individual appointed by a named designee and approved by the Department.
17. The transportation of radioactive materials and radioactive waste within the State of South Carolina shall be in accordance with applicable regulations of the U.S. Department of Transportation, the U.S. Nuclear Regulatory Commission, Section RHA 2.22, Department Regulation 61-63, Radioactive Material (Title A), and Department Regulation 61-83, "Transportation of Radioactive Waste Into or Within South Carolina".
18. The licensee shall maintain all records and shipment manifest pertinent to the transportation, receipt, and disposal of radioactive material at the location specified in Condition 9 of this license until authorization is given by the Department for transfer or disposal of such records.
19. The licensee shall maintain records for each shipment of waste disposed of at the site. The records shall conform with the requirements of RHA 7.32, Department Regulation 61-63, Radioactive Material (Title A).
20. A monthly site receipt and burial activities report shall be submitted no later than the 10th day following the month to the Director, Division of Radioactive Waste Management, Bureau of Land & Waste Management, S.C. Department of Health & Environmental Control, 2600 Bull Street, Columbia, South Carolina 29201.
21. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 5, 6, and 7 of this license and conduct site operations in accordance with statements, representations, operating procedures, and disposal criteria, heretofore made by the licensee or his authorized representative in application for and subsequent to issuance of S.C. Radioactive Material License No. 097, and amendments thereto.

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Receipt, Acceptance and Inspection Conditions

22. The licensee shall not accept radioactive waste for storage or disposal unless the shipper has completed the required information for the waste shipment on the U.S. Nuclear Regulatory Commission Uniform Low-Level Radioactive Waste Manifest Forms 540 (Shipping Paper), 541 (Container and Waste Description), and 542 (Manifest Index and Regional Compact Tabulation) as applicable, or approved equivalent forms.
23. The licensee shall not accept radioactive waste for storage or disposal unless the generator of such waste has a valid, unsuspended Radioactive Waste Transport Permit issued by the S.C. Department of Health and Environmental Control.
24. The licensee shall not accept radioactive waste for storage or disposal unless the shipper has provided a properly executed Department Form, DHEC-803, Radioactive Waste Shipment Certification Form, Part I and II. Shipments consisting of more than 75 cubic feet or containing more than one (1) curie shall also be accompanied by a properly completed and executed Department Form, DHEC-802, Radioactive Waste Prior Notification and Manifest Form. Changes to the shipment identification number on the forms may be made by the licensee, provided that the Department is

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notified of the change no later than the last day of the month for which the shipment was originally scheduled. Forms shall not be carried over more than one month.

25. The licensee shall only accept radioactive waste shipments for storage or disposal which have been inspected by a representative of the Department. The licensee shall assist the Department in inspection, sampling and analysis of the waste as deemed necessary by the Department to ensure compliance with the requirements of this license.
26. Notwithstanding other conditions of this license, the licensee shall not accept radioactive waste for storage or disposal unless he has received advanced written notification of any waste shipment containing unusual hazards or potential hazards including but not limited to, physical, gaseous, chemical, pyrophoric, or excessive removable contamination on the disposal containers shipped inside casks or excessive internally contaminated casks, and unexpected high radiation levels at the disposal container surfaces.
27. The licensee shall immediately notify the Department or the Department's on-site representative of any waste shipments where a violation of applicable regulations or license conditions has been found.
28. The licensee shall notify the shipper and the Department when any shipment of radioactive waste or part of a shipment has not arrived within 60 days after the advance copy of the shipment manifest or shipping papers was received by the licensee.
29. The licensee shall notify the shipper when it has been determined that a radioactive waste shipment or part of a shipment cannot be accepted for disposal by the licensee.
30. The licensee shall acknowledge receipt of the waste within 7 days of its acceptance for disposal by returning a signed copy of the shipment manifest or shipping papers to the shipper. The licensee shall indicate on the returned copy of the shipment manifest or shipping papers any discrepancy between the waste description listed on the manifest or papers and the waste materials received in the shipment.

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Waste Characteristics and Waste Form Conditions

31. The licensee shall not accept any radioactive waste for storage or disposal unless the shipper has marked each disposal container, as specified by the licensee, to identify its classification as either Class A, stable or unstable (S or U), Class B, or Class C waste, and certifies that the waste materials have been classified and prepared in accordance with the following waste classification table:
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Waste Classification Table

RADIONUCLIDES

	CONCENTRATION LIMITS IN CURIES/CUBIC METER*		
	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>
<u>Table I (long-lived)</u>			
C-14.....	≤ 0.8		≤ 8
C-14 in activated metal.....	≤ 8		≤ 80
Ni-59 in activated metal.....	≤ 22		≤ 220
Nb-94 in activated metal.....	≤ 0.02		≤ 0.2
Tc-99.....	≤ 0.3		≤ 3
I-129.....	≤ 0.008		≤ 0.08

	CONCENTRATION LIMITS IN NANOCURIES/GRAM	
Alpha emitting transuranics with half-life greater than 5 years...	≤ 10	≤ 100
Ra-226.....	≤ 10	≤ 100
Pu-241.....	≤ 350	≤ 3500
Cm-242.....	≤ 2000	≤ 20000

	CONCENTRATION LIMITS IN CURIES/CUBIC METER*		
	<u>Class A</u>	<u>Class B</u>	<u>Class C</u>
<u>Table II (short-lived)</u>			
Total of all with half-life less than 5 years.....	≤ 700	> 700	
H-3.....	≤ 40	> 40	
Co-60.....	≤ 700	> 700	
Ni-63.....	≤ 3.5	≤ 70	≤ 700
Ni-63 in activated metal.....	≤ 35	≤ 700	≤ 7000
Sr-90.....	≤ 0.04	≤ 150	≤ 7000
Cs-137.....	≤ 1	≤ 44	≤ 4600

\*curies/cubic meter is equivalent to microcuries/cubic centimeter

A. The concentration of a radionuclide or radionuclide mixture may be averaged over the volume of the waste and, if used, the solidification agent or matrix if the waste form is a homogenous mixture. The concentration of radionuclides in filters/sealed sources encapsulated with a solidification agent or matrix shall be averaged over the volume of the filter/sealed source not the solidification agent. The volume of packaging, containers, liners, or overpacks shall not be included in this calculation, nor shall the volume of the waste mixture be artificially increased with the addition of non-dispersible solids or objects even if considered as waste.

If expressed in units of nanocuries per gram, concentration may be averaged over the weight of the waste and, if used, the solidification agent if homogenous, except in the case of encapsulation of filters which shall be over the weight of the filter. The weight of packaging, containers, liners, or overpacks shall not be included in this calculation, nor shall the weight of the waste mixture be artificially increased by the addition of heavy, non-dispersible solids or objects even if considered as waste.

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Supplementary Sheet

License Number 097  
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- B. The waste is Class A if none of the listed radionuclides are present.
- C. There are no upper limits in Class B waste for the first three radionuclides listed in Table II.
- D. There are no Class B values for the first nine (9) radionuclides listed; their presence classifies the waste as either Class A or Class C according to their concentrations.
- E. The waste class for mixtures of radionuclides is determined by deriving for each radionuclide the ratio between its concentration in the mixture and its concentration limit in the table and adding the resulting ratio values for each radionuclide group. All limits used in the calculation must be for the same waste class. The sum of the ratios for each group must be less than or equal to 1.0 or the waste is of a higher classification than that used for the calculation.
- F. If Class C limits are used in the calculation and the sum of the ratios for either group is equal to or exceeds 1.0, the waste is not acceptable for disposal without prior written approval from the Department.
- G. If the concentration of any single radionuclide exceeds Class C values in the table, the waste is not acceptable for disposal without prior written approval from the Department.
- H. Concentrations for C-14, Ni-59, Ni-63, and Nb-94 in activated metal must be evaluated for any irradiated metal component, filters and filter material associated with spent fuel pools.
- I. Waste containing radium may be accepted only if the requirements of condition 44 of this license are met.
32. A. Unless otherwise specified in this license, the licensee shall not receive any liquid radioactive waste regardless of the chemical or physical form. Absorbent materials may be placed in packages of dry, solid waste to absorb unintentional and incidental amounts of liquids. Further, liquids in the interstitial spaces of transport casks and containers shall be removed to the extent practical.
- B. Solidified or dewatered radioactive waste shall have no detectable free standing liquids in excess of one-half percent (0.5%) by waste volume of non-corrosive liquids per container.
- C. In lieu of the requirements of paragraph B. above, solidified or dewatered waste containing non-corrosive liquids in excess of one-half percent (0.5%) by waste volume, and less than one percent (1%) non-corrosive liquids by waste volume, may be received and disposed of in high integrity containers approved by the Department.
33. A. Unless otherwise specified, the licensee shall only receive aqueous liquids and other applicable waste forms which have been solidified or otherwise stabilized with one of the following solidification media:
- a. Vinyl Ester Styrene
  - b. Cement
  - c. Bitumen (see Subparagraph E. below)
  - d. Vinyl Chloride

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- B. Solidification media and processes used to stabilize Class A aqueous liquids and other Class A wastes containing isotopes with greater than five (5) year half-lives having a total specific activity if all these isotopes of 1 microcurie/ cubic centimeter or greater, and all applicable Class B and C waste, shall meet and have been evaluated in accordance with the "Stability Guidance" requirements of the U.S. Nuclear Regulatory Commission's Waste Management Division, Technical Position on Waste Form, (Revision 1), dated January 1991, or other evaluation criteria or methods specifically approved by the NRC or the Department.
- C. Solidified Class A aqueous liquids and other applicable waste forms with a specific activity of less than 1 microcurie/cubic centimeter, shall meet the requirements of the "Solidified Class A Waste Products" of the NRC Technical Position on Waste Form, (Revision 1) dated January 1991.
- D. Other solidification media and processes shall be acceptable for which a topical report has been prepared and received approval from the U.S. Nuclear Regulatory Commission with concurrence from the Department or approval by the Department.
- E. The licensee shall only receive for disposal, full formula, oxidized bitumen (asphalt) solidified waste, which is a free standing monolith as received for disposal, and certified as such by the waste generator.
34. Except as specifically provided in this license, the licensee shall not accept liquid radioactive waste packaged in absorbent materials, or where absorbent materials have been used to absorb liquids rather than properly solidified with an approved media.
35. Regardless of the waste classification of Condition 31, and unless otherwise authorized by the Department, the licensee shall not receive evaporator bottoms or concentrates, residues, sludges, or other waste which may contain free standing liquids, unless they are solidified in accordance with Condition 33, and meet the requirements as specified in Condition 32. Evaporator bottoms or concentrates which contain no free standing water and are not free flowing are acceptable for disposal when processed by a method specifically approved by the Department.
36. The licensee may receive resins and filter media in a dewatered form provided that the free standing liquid requirements of Condition 32 and the requirements of Condition 38 are met.
37. The licensee shall not receive containers of ion exchange resins or filter media (dewatered or solidified) unless records of complete radiological analyses (quantitative and qualitative) are provided. The records must specify the specific activity of each radionuclide expressed in microcuries/cubic centimeter and transuranic radionuclides in nanocuries/gram.
38. Regardless of the waste classification of Condition 31, ion exchange resins and filter media containing isotopes with greater than five (5) year half-lives having a specific activity of all these isotopes of 1 microcurie/cubic centimeter or greater must be stabilized by solidification in accordance with Condition 33 and meet the free standing liquid requirements of Condition 32.B. However, in lieu of solidification, the Department will authorize disposal of these waste forms meeting the free standing liquid requirements of Condition 32.C. in approved high integrity containers or other approved methods of stabilization.