

**METAL MELT**

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
 DIVISION OF RADIOLOGICAL HEALTH
 William R. Snodgrass TN Tower 312 Rosa L. Parks Avenue, 15th Floor Nashville, TN 37243
 615-532-0364

RADIOACTIVE MATERIAL LICENSE

Amendment 111

Pursuant to Tennessee Department of Environment and Conservation Regulations, and in reliance on statements and representations heretofore made by the licensee, 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. This license is subject to all applicable rules and regulations of the Tennessee Department of Environment and Conservation and orders of the Division of Radiological Health, now or hereafter in effect and to any conditions specified below.

<p style="text-align: center;">LICENSEE</p> <p>1. Name EnergySolutions Services, Inc.</p> <p>2. Address 1560 Bear Creek Road Oak Ridge, Tennessee 37830</p>	<p>3. License number R-73016-G25</p> <p>4. Expiration date July 31, 2025</p> <p>5. File no. R-73016</p>
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<p>6. Radioactive Material (Element and Mass Number)</p>	<p>8. Chemical and/or physical form</p>	<p>9. Maximum Radioactivity and/or quantity of material which licensee may possess at any one time.</p>
<p>SEE SUPPLEMENTARY SHEETS</p>		

<p>10. Authorized Use</p> <p style="text-align: center;">SEE SUPPLEMENTARY SHEETS</p>
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CONDITIONS

11. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

For the Commissioner
 Tennessee Department of Environment and Conservation

Date of Issuance: September 12, 2017

By: _____

Division of Radiological Health
 Ronald J. Parsons, Environmental Consultant



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6. Radioactive Material (Element and <u>Mass Number</u>)	8. Chemical and/or <u>Physical Form</u>	9. Maximum Radioactivity and/or Quantity of Material Which Licensee May <u>Possess at Any One Time</u>
A. Mixed activation and fission products with atomic numbers 3-83 in- clusive (not C-14 or Fe-55)	A. Any form as suitable for transport under U. S. DOT Regulations	A. 10,000 Curies +
B. Hydrogen 3	B. Same as 8.A.	B. 5,000 Curies +
C. Carbon 14	C. Same as 8.A.	C. 500 Curies +
D. Iron 55	D. Same as 8.A.	D. 7,500 Curies +
E. Polonium 210	E. Same as 8.A.	E. 10 Curies +
F. Radium 226	F. Same as 8.A.	F. 20 Curies +
G. Thorium 232	G. Same as 8.A.	G. 20 Curies +
H. Uranium – depleted and natural	H. Same as 8.A.	H. 350 Curies +
I. Uranium (not U-233, U- 235, or U-238)	I. Same as 8.A.	I. 2 Curies +
J. Uranium 233	J. Same as 8.A.	J. 200 grams *+
K. Uranium enriched in U- 235	K. Same as 8.A.	K. 350 grams *+ of contained U-235
L. Plutonium	L. Same as 8.A.	L. 200 grams *+
M. Americium 241	M. Same as 8.A.	M. 10 Curies +



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|--|-----------------|---------------|
| N. Transuranics (not Pu or Am-241) | N. Same as 8.A. | N. 5 Curies + |
| O. Radioactive materials with atomic numbers 84-91 inclusive (not Po-210, Ra-226, or Th-232) | O. Same as 8.A. | O. 5 Curies + |
- + Combined possession limit for *EnergySolutions* licenses R-73008 and R-73016 at the Bear Creek Operations facility
- * For each kind of special nuclear material determine the ratio between the quantity of that special nuclear material and the quantity specified here for the same kind of special nuclear material. The sums of such ratios for all kinds of special nuclear material in combination shall not exceed "1" (i.e. unity).
- | | | |
|---|--|---|
| P. Any radioactive material (except special nuclear material) | P. Sealed sources (Model numbers listed in NRC Registry of Sealed Sources and Devices), surface-deposited disc and plane sources, and volumetric reference sources | P. No single source to + exceed 5 millicuries. Total not to exceed 10 millicuries. |
| Q. Any radioactive material (except special nuclear material) | Q. Electroplated, vapor-deposited, or similar metallic disc or foil source and solid coupon sources, all as described in letter dated April 11, 2005, with attachments. This does not include filled capsules, seeds, or needle sources. | Q. No single beta-gamma + Source to exceed 250 microcuries. No single alpha source to exceed 25 microcuries |



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10. Authorized Use

- A. through O. Receipt, possession, inspection, storage, handling, sorting, consolidation, unpacking, packaging, consolidation, transport, transfer, processing operations, decontamination, maintenance, repair, surveys, sampling and analysis, laboratory operations, sealed source leak tests, release for unrestricted use, research and testing, and the bulk waste assay program (BWAP) all in accordance with documents referenced in conditions of this license.
- P. Instrumentation standardization and calibration sources.
- Q. Processing by addition to the metal melt induction furnace during molten steel operations in accordance with statements, representations, and procedures contained in letter dated April 11, 2005, with attachments, and other conditions of this license.

Conditions

12. The licensee shall comply with applicable provisions of 0400-20-04, 0400-20-05, 0400-20-10, and 0400-20-13 of "State Regulations for Protection Against Radiation."
13. Radioactive material authorized by this license shall be used and stored at EnergySolutions Services, Inc., Metal Melt Operations (MMO) facilities at 1560 Bear Creek Road, Oak Ridge, TN in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license.
14. A. Radioactive material authorized by this license shall be used by, or under the supervision of, the following Authorized Users as specified:

Metal Melt Facility (MMF) Operations

1. An Authorized User shall be present on site during molten metal operations. The melters (lead melters/kettles and the steel induction furnace) are considered to be in operation when they contain molten metal or when power is being applied to the steel furnace induction coil. When melting clean (non-contaminated lead) for recycle/release, an Authorized User is not required to be present.



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2. An Authorized User shall be available for telephone consultation during periods when other MMF authorized activities are being conducted.
3. MMF Authorized Users

David Caldwell, Tony Guinn, Rhonda Jackson, Daryl Jarnigan, James Kline, Chuck Norman, Noah Roberts, Max Spurling, Christopher Strey, Michael Stevens, Adrian Thompson, Noel Peters, Roger Jones, Josh Cox, Chris Thurman, or Jack Clark

Parcel 4 Facility (P4) Operations

1. An Authorized User shall be present on site during any operations/process being performed in the P4 Facility.
2. An Authorized shall be available for telephone consultation during periods when other authorized activities are being conducted in the P4 Facility.
3. P4 Authorized Users

Phillips Booher, Mike Burgess, Joni Garrett, Chuck Norman, Brian Parsons, Noel Peters,
Bryan Sims, or Donna Webb

Radioactive Material Solutions (RMS) Facility Operations

1. An Authorized User shall be present on site during any operations/process being performed in the RMS Facility.
2. An Authorized shall be available for telephone consultation during periods when other authorized activities are being conducted in the RMS Facility.
3. RMS Authorized Users

Tim Bauer, Eddie James, Chuck Norman, Randy Owensby, Brian Parsons, Christopher Strey, Chris Brown, Matt Moses, Roger Jones, Josh Cox, Chris Thurman, or Jack Clark



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Site Logistics Authorized Users

Brian Mayes, Bruce Stephenson, Fred Schulz, Brad Melton, Nick Arden, Jeffery Saffell, or Ronald Hamilton

- B. A Radiation Safety Technician shall be on site during all work being performed in Radiologically Controlled Areas (RCA) associated with this license.
 - C. The Radiation Safety Officer for this license is Duane R. Quayle.
15. A. The licensee shall develop and maintain a written radiation protection manual that ensures the implementation of the radiation protection program in accordance with "State Regulations for Protection Against Radiation" (SRPAR), ALARA, and documents referenced in conditions of this license. Changes to this manual require prior written approval from the Department.
- B. In addition, the licensee shall develop and implement written standard operating procedures to ensure all activities involving the handling and/or use of radioactive materials authorized by this license are carried out in a manner consistent with SRPAR, ALARA, the licensee's radiation protection manual, and the documents referenced in conditions of this license.
 - C. These procedures may be modified without prior approval of the Department when deemed appropriate and documented by the Radiation Safety Officer. However, adherence to the current procedures as written shall be considered a condition of this license. The written procedures required by this condition shall be available for inspection by the Department. A copy of the current procedures shall be forwarded to the Department upon request.
16. A. The licensee is authorized to release material for unrestricted use in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license. Surface contamination that is present on materials shall meet the criteria set forth in Regulatory Guide 1.86.



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- B. The licensee is not authorized to release for unrestricted use materials which have been formed, generated, or produced as a result of metal melting. Such materials shall only be transferred to persons specifically licensed by the Department, the U. S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State to receive such material, or to an Agency of the Federal Government that has been exempted from licensing regulation by Federal Law.
17. Bulk Survey for Release (BSFR)
- A. The licensee is authorized to conduct the Bulk Waste Assay Program (BWAP) which includes Green is Clean (GIC), the Safe Check program for gamma emitters, the Safe Check program for non-gamma emitters, and Decay Check. The BWAP shall be conducted in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license and applicable documents in *EnergySolutions* Tennessee Radioactive Material License R-73006. The Radium 226 disposal limit for Carter Valley Landfill will be 5 pCi per gram.
- B. The licensee is authorized to implement BWAP release limits for Carter Valley Landfill disposal of Safe Check and Decay Check program licensed material in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license and applicable documents in *EnergySolutions* R-73006 including the "Technical Basis for Safe Check and Decay Check Conditional Release Limits," Revision 5, and the most current BSFR concentration limits established by the Division of Radiological Health for Carter Valley Landfill.
- C. Records of all disposals made under this condition shall be submitted quarterly to the Division of Radiological Health, William R. Snodgrass Tennessee Tower, 15th Floor, 312 Rosa L. Parks Avenue, Nashville, Tennessee 37243. Monitoring of materials for contamination for release as authorized by this condition is only to be conducted at the licensee's facilities specified in Condition 13 of this license, and not at customer or other job sites.
- D. The licensee shall meet the requirements of the March 2017 "Licensing Requirements for Evaluation and Acceptance of Licensee Requests for the Disposal of Materials with Extremely Low Levels of Contamination in Class 1 (Subtitle D) Landfills."



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- E. For calendar year 2017 the licensee is approved to dispose of 2102 tons of material in the Carter Valley Landfill. This is a combined disposal limit with EnergySolutions R-73006-L24.
- 18. A. The Box Assay System shall be operated in accordance with the requirements and specifications found in the "Technical Basis for Design and Calibration of the Duratek Box Assay System," Revision 2. Additionally, the waste density shall not exceed 3.0 g/cc, and the volume of waste assayed in any single container shall have multiple counts to ensure each four-foot by six-foot cross section (or less) of the container or item is assayed by the system.
- B. The Guardian Assay System shall be operated in accordance with the requirements and specifications found in the "Technical Basis for Design, Calibration, and Operation of the Guardian Mobile Assay System," Revision 0.
- 19. The licensee in making disposal of radioactive wastes to the sanitary sewerage system shall do so in conformity with 0400-20-05-.122 of "State Regulations for Protection Against Radiation."
- 20. The licensee is authorized to release asphalt/concrete from areas previously used for radioactive material storage in accordance with statements, representations, and procedures contained in the EnergySolutions Radiation Safety Guide (RSG-1). Asphalt/concrete released in accordance with this condition shall not be reintroduced to the general public for use as fill or recycling. Excavated material containing no detectable radioactivity when assayed in accordance with the current BWAP program requirements may be used as clean fill at the Bear Creek site.
- 21. A. No radioactive materials (excluding calibration and standardization sources) or radioactive waste may be possessed under this license, from the time of receipt until its transfer from the facility, for a period of time greater than three hundred sixty five (365) days. Exceptions to this three hundred sixty five (365) day time period are as follows:
 - 1. Equipment or a product, specifically licensed or otherwise authorized, and stored on-site for future use: (1) at a location authorized by an EnergySolutions Tennessee Radioactive Material License or (2) at a location where such material is authorized by the agency having jurisdiction.



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2. Up to 20,000 cubic feet of radioactive waste may be stored for an unlimited period of time. This volume may be increased to 40,000 cubic feet until March 31, 2018, with this volume reverting back to 20,000 cubic feet on April 1, 2018. Radioactive waste stored under this provision shall not include TRU wastes (wastes containing concentrations greater than 100 nCi/gm of transuranics) or mixed wastes (radioactive wastes which exhibit the characteristics outlined in Subpart C of 40 CFR Part 261 or radioactive wastes which contain hazardous wastes listed in Subpart D of 40 CFR Part 261). The licensee shall maintain records of the receipt and storage of this material such that its volume and location are readily identifiable.
 3. Lead and lead fabricated objects may be possessed for no more than 18 months from the initial date of receipt after it is determined to be material for casting into a beneficial reuse product due to final survey failure. All lead and lead fabricated objects will be subject to Condition 21.A.2 with respect to the inventory tracking of aged waste greater than 365 days, not to exceed 18 months from the initial date of receipt.
 4. Radioactive material may be stored for up to five years from the time of receipt acceptance in the RMS facility.
- B. No radioactive material or radioactive waste may be stored so as to exceed the following stacking limits:

<u>Container Type</u>	<u>Stacking Limit</u>
1. Drums	3 high
2. B-25 Boxes	3 high
3. B-12 Boxes	5 high
4. Sea-Land Cont.	2 high
5. Any other strong tight container.	10 feet nominal

- C. This condition also includes "waste radioactive material" generated under the authority of this license.



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22. Radioactive material, contaminated equipment, and empty radioactive material containers may be stored in accordance with statements representations, and procedures contained in documents referenced in conditions of this license, provided that radiation levels for unrestricted areas are not exceeded. This material must be stored in either locked DOT intermodal containers as described in Title 49 Code of Federal Regulations (CFR), Part 171.8 or DOT approved strong tight containers. In addition to these requirements the following criteria and restrictions must be adhered to whenever radioactive materials are stored:
 1. Containers used for outside storage of radioactive materials must be capable of withstanding environmental conditions. Wooden containers are not considered suitable for outside storage. Materials received in wooden containers may remain outside for a period not to exceed fifteen (15) days, provided the containers are covered with a waterproof tarp so as to prevent the infiltration of rainwater. After 15 days the material must be moved inside or repackaged in a container suitable for outside storage.
 2. Radiation levels from stored empty containers shall not exceed an average of 0.5 mR/hr, and hot spot activity shall not exceed 2 mR/hr.
 3. Outside storage of containers with radioactive waste and/or DOT Empty containers is only permitted in paved (asphalt or concrete) areas. Storage on grass, dirt, or gravel of containers with radioactive waste and/or DOT Empty containers is specifically prohibited.
 4. Soil samples must be collected and analyzed at least quarterly along the edges of outside asphalt or concrete pads where radioactive materials are stored and along the perimeter fence to ensure that there is no buildup of radioactive contamination. Data from these samples must be maintained for inspection by the Department.
 5. Each designated outside storage area shall be equipped with identifiable markers (sign postings) at each corner to clearly identify the boundary. In addition, the space between these markers shall be painted on the surface of the asphalt/concrete or otherwise marked to further identify the storage areas.



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6. *EnergySolutions* Empty containers (loose surface contamination levels less than 1000 dpm/100 cm² beta/gamma and less than 100 dpm/100 cm² alpha external and internal) are permitted to be stored on any surface (e.g. paved, grass, dirt, or gravel) within any area that is routinely monitored by the environmental sampling program for radioactivity within the licensed property.

The combined authorizations for storage under this license and R-73008 shall be in accordance with the currently approved Bear Creek Operations Radioactive Material/Waste Container Storage Plan.

23. The licensee shall maintain complete and accurate records of the receipt and disposal of radioactive material. The licensee shall, for radioactive material no longer useful for any purpose and for any equipment or supplies contaminated with such material for which further use and decontamination are not planned, define those materials as radioactive waste and treat them as such in accordance with the following provisions:

- A. Radioactive waste material shall not be stored with non-radioactive waste.
- B. A written record of all radioactive waste material shall be maintained until it has been determined by a suitable survey or radioassay that it has decayed to background levels or until it has been shipped to an authorized recipient in accordance with applicable regulations.

Accountability of radioactive waste material prepared for shipment but not yet shipped from the licensee's premises shall be maintained by the licensee by an internal record system such that the licensee is constantly aware of the material's location and the proposed time of shipment. Individuals who are involved in the shipping of such material and/or the storage of such material prior to shipment, shall be trained in the precautions necessary for such handling and storage.

- C. For material which has decayed to background levels as determined by radioassay or external level as measured with appropriately calibrated instruments, records shall indicate that the material was determined to be no longer radioactive and will indicate the methods and results of the survey or analysis.



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- D. Shipment records of radioactive waste material shall be maintained and the licensee shall require written confirmation from the authorized recipient of such material that this material has been received.
- E. Transfer of radioactive waste to a land disposal facility or a licensed waste handler shall be done in accordance with 0400-20-05-.125 of "State Regulations for Protection Against Radiation."
- F. All records and written confirmations required by this condition shall be maintained for inspection by the Department.

The requirements of this condition are in addition to any other requirements for the handling and/or disposal of radioactive material contained in this license and "State Regulations for Protection Against Radiation."

- 24. The licensee shall not accept either radioactive waste and/or items contaminated or potentially contaminated with licensable quantities of radioactive material or radioactive materials or items from licensable activities for repackaging, processing, storage pending transfer/disposal or transfer/disposal unless the shipper of such waste possesses a valid license for delivery issued pursuant to 0400-20-10-.32 of "State Regulations for Protection Against Radiation."
- 25. Written assurances must be furnished by the facility shipping the radioactive material indicating that the facility may accept return of the material processed or unprocessed. In addition, for states outside the Southeast Compact, the state or appropriate Compact must be a signatory to the Interregional Access Agreement for Waste Management or assurances shall be obtained from the appropriate state governor's office, the state radiation control program, and the appropriate Compact official, if any.
- 26. The licensee shall establish in every contractual obligation relating to radioactive materials the ability to return radioactive materials, processed or unprocessed, to the prior licensed or exempt possessor.



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27. A. Beta and/or gamma sealed sources containing more than 100 microcuries, and alpha sealed sources containing more than 10 microcuries, authorized by this license shall be tested for leakage and/or contamination at intervals not to exceed six (6) months. In the absence of a certificate from a transferor indicating that a test has been made within six (6) months prior to transfer, the sealed source shall not be put into use until tested.
- B. The licensee is authorized to perform leak testing of sealed sources and analytical services for EnergySolutions facilities, and for hire, in accordance with statements, representations, and procedures contained in documents referenced in conditions of this license. Customers shall be provided with leak test results in microcuries.
- C. The tests shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample, or in the case of radium, the escape of radon at the rate of 0.001 microcurie per 24 hours. The test sample shall be taken from the sealed source or from the surface of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak tests shall be kept in units of microcuries and maintained for inspection by the Department.
- D. If the test reveals the presence of 0.005 microcurie or more of removable contamination, or in the case of radium, the escape of radon at the rate of 0.001 microcurie or more per 24 hours, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Department regulations. A report shall be filed within five (5) days of the test with the Division of Radiological Health, Tennessee Department of Environment and Conservation, William R. Snodgrass Tennessee Tower, 15th Floor, 312 Rosa L. Parks Avenue, Nashville, Tennessee, 37243, describing the equipment involved, the test results, and the corrective action taken.
28. The licensee shall not open sealed sources containing radioactive material.
29. Calibrations of radiation detection equipment and pocket and electronic dosimeters shall be performed in accordance with statements, representations, and procedures contained in RSG-1.



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30. The licensee shall conduct a physical inventory every six (6) months to account for all sealed sources and/or devices received and possessed under this license. Records of inventories shall be maintained for inspection by the Department.
31. The licensee is authorized to receive, possess, and use any radioactive material distributed under a general license, issued by the U.S. Nuclear Regulatory Commission, or another Agreement State, without being specifically referenced in Items 6, 8, 9 and 10 of this license. Notwithstanding any other conditions of this license, the general licensee may possess and use radioactive material received under the provisions of 0400-20-10 of "State Regulations for Protection Against Radiation" in accordance with the requirements provided at the time of the transfer of the radioactive material under the terms of the general license.
32. The following evaluations shall be performed for all process ventilation systems:
 - 1) Air balance within the RCA at least semi-annually, and following any ventilation system or process changes which could potentially alter the effectiveness of the system,
 - 2) Particulate removal efficiency of the main filtration system HEPA filters by DOP or comparable testing in accordance with pertinent ANSI standards immediately following installation of new HEPA filters or at least semi-annually.
33. In addition to other requirements of this license or of Chapter 0400-20-05-.60 of "State Regulations for Protection Against Radiation," the licensee shall conduct operations so that radiation levels in unrestricted areas would not cause an individual, assuming an occupancy of one (1), to receive a total effective dose equivalent in excess of 500 millirems in one calendar year. These radiation levels shall be appropriately monitored by the licensee, and records of such monitoring shall be maintained for inspection by the Department. For calculational purposes of this condition, the licensee shall base its anticipated exposure to a member of the public upon the sum of the maximally exposed TLD (or equivalent dosimeter) and the highest air concentration derived using the latest available pertinent data.



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34. The licensee is authorized to conditionally release decontaminated metals to a commercial steel mill in accordance with references in conditions of this license in order to demonstrate the feasibility of recycling radioactively contaminated metals into radioactive waste storage and disposal containers. The rolled sheet metal will be returned to EnergySolutions for container fabrication. Only cast products that have been surveyed and found to measure below the free release guidelines of U.S. Nuclear Regulatory Guide 1.86, and that contain volumetric radioactivity concentration below 10 pCi/gram of uranium and 10 pCi/g of Technetium 99, and contain no detectable gamma-emitting radionuclides as evidenced by a gamma spectroscopy system shall be free released. Analytical techniques shall be utilized which have minimum detectable activities of 1 pCi/g for uranium and 1 pCi/g for Technetium 99, and for other radionuclides as provided in the license.
35. Notwithstanding the requirement of Condition 16.B. of this license, the licensee is authorized to transfer materials containing radioactivity which have been formed, generated, or produced as a result of metal melting, to the KEK accelerator facility in Japan in accordance with the authority granted to that facility by the agency having jurisdiction over the facility concerning the receipt and possession of radioactive material. This authority is described in letter dated June 3, 2005, with attachments.
36. The licensee is authorized to institute the contractual mechanisms described in letter dated November 15, 2005, for international customers to demonstrate compliance with the ability to return radioactive materials, processed or unprocessed, to the prior licensed or exempt possessor.
37. The licensee is authorized to install, test, and operate production processes as described in attachment to letter dated June 11, 2009, and attachments to letter dated July 14, 2010, for the production of usable reagents and waste treatment. This condition also grants authorization to use the output of the processes for treatment of low level radioactive wastes that require treatment for leachable metals, neutralization of contaminated acids, and related applications. These authorizations shall be conducted in accordance with statements, representations, and procedures contained in letters dated June 11, 2009, with attachment, July 14, 2010, with attachments, and other documents referenced in conditions of this license.
38. The total annual maintenance fee amount due for this license is \$99,000.00.



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39. The licensee is authorized to conduct Advanced Characterization and Optimized Storage Facility operations within the Radioactive Materials Solutions (RMS) facility in accordance with statements, representations, and procedures contained in letters dated February 24, 2014, March 27, 2014, with attachments, and other documents referenced in conditions of this license.
40. No provision of this license relieves the licensee from compliance with other Federal, State, and local laws, ordinances, and regulations applicable to the licensee's activities.
41. Except as specifically provided otherwise by this license, the licensee shall possess and use radioactive material described in Items 6, 8, and 9 of this license in accordance with statements, representations, and procedures contained in the following:
 - Application dated May 21, 2015, with attachments
 - Letters dated April 11, 2005, with attachments, June 3, 2005, with attachments, November 15, 2005, June 11, 2009, with attachment, July 14, 2010, with attachments, February 24, 2014, March 27, 2014, with attachments, May 21, 2015, and August 3, 2017, with attachments
 - Bear Creek Operations Integrated Response Plan received May 26, 2015