ENERGYSOLUTIONS

April 21, 2016 CD16-0085

Mr. Scott T. Anderson
Director
Division of Waste Management and Radiation Control
195 North 1950 West
Salt Lake City, UT 84114-4880

Subject: Request for a Site-Specific Treatment Variance for Wastes Containing High-Subcategory Mercury

Dear Mr. Anderson:

Energy*Solutions*, LLC hereby requests a variance that provides an exemption from 40 CFR 268.40(a)(3) for wastes that are characterized with hazardous waste codes D009 or U151, High Mercury-Organic Subcategory or High Mercury-Inorganic Subcategory.

This request is submitted in accordance with Utah Administrative Code (UAC) R315-13-1 (40 CFR 268.44 incorporated by reference), which allows a site-specific variance from an applicable treatment standard provided that the following condition is met:

> 40 CFR 268.44(h)(2) It is inappropriate to require the waste to be treated to the level specified in the treatment standard or by the method specified as the treatment standard, even though such treatment is technically possible.

This request is submitted in accordance with the requirements of 40 CFR 260.20(b).

40 CFR 260.20(b)(1): This petition is being submitted by

> Energy*Solutions*, LLC
> 299 South Main Street, Suite 1700
> Salt Lake City, UT 84111

40 CFR 260.20(b)(2): Energy*Solutions* requests approval to receive and dispose, in Energy*Solutions*' Mixed Waste Landfill Cell, waste containing the D009 or U151 High Mercury-Organic Subcategory and High Mercury-Inorganic Subcategory hazardous waste codes that has been treated using stabilization/amalgamation technologies. Furthermore, Energy*Solutions* will perform the stabilization/amalgamation treatment on D009 and U151 High Mercury Subcategory waste streams that have not been treated prior to arrival at the Energy*Solutions* Clive facility. All actions will be performed in accordance with Energy*Solutions*' State-issued Part B Permit.

40 CFR 260.20(b)(3): Energy*Solutions* proposes to dispose of treated High Mercury Subcategory hazardous waste that has been treated below a mercury concentration of 0.2 mg/L using the Toxicity Characteristic Leaching Procedure (TCLP). Additionally, Energy*Solutions* proposes to dispose of treated High Mercury Subcategory contaminated soil that has been treated below a mercury concentration of 0.25 mg/L TCLP.

Energy*Solutions* proposes to perform the stabilization/amalgamation treatment for waste that has not been treated prior to arrival at Energy*Solutions*' Clive facility. Waste concentrations for off-site treated waste will be verified by sampling incoming waste shipments in accordance with Attachment II-1, *Waste Analysis Plan*, of Energy*Solutions*' State-issued Part B Permit. Waste concentrations for on-site treated waste will be verified using the procedures described in Attachment II-1-3, *Waste Stabilization Plan*. Further, all other constituents of the waste will be verified Land Disposal Restriction (LDR) compliant prior to disposal.

40 CFR 260.20(b)(4): The D009 High Mercury-Organic Subcategory is described in the "Treatment Standards for Hazardous Waste" table in 40 CFR 268.40. The description is as follows:

> "Nonwastewaters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the toxicity characteristic leaching procedure (TCLP) in SW846; and contain greater than or equal to 260 mg/kg total mercury that also contain organics and are not incinerator residues. (High Mercury-Organic Subcategory)"

Likewise, the D009 High Mercury-Inorganic Subcategory's description is as follows:

> "Nonwastewaters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the toxicity characteristic leaching procedure (TCLP) in SW846; and contain greater than or equal to 260 mg/kg total mercury that are inorganic, including incinerator residues and residues from RMERC. (High Mercury-Inorganic Subcategory)"

The U151 hazardous waste code does not delineate between organic or inorganic; the description simply states the following:

> "U151 (mercury) nonwastewaters that contain greater than or equal to 260 mg/kg total mercury."

The listed treatment technology in 40 CFR 268.40 for the D009 High Mercury-Organic Subcategory is either incineration (IMERC) or retorting/roasting for mercury recovery (RMERC). The listed treatment technology for the D009 High Mercury-Inorganic Subcategory and for U151 is RMERC.

The need and justification for this action are as follows:

- The intent of the RMERC treatment process is to recover elemental mercury for recycling. However, radioactive mercury cannot be recycled and the RMERC process generates secondary waste (radioactive elemental mercury) which requires additional treatment by amalgamation (a stabilization technology) prior to disposal.

- The IMERC technology is also intended to be a mercury recovery technology where the waste is incinerated and the mercury recovered in the ash or in a specific off-gas control system. For radioactive mercury, both the ash and the control equipment/media will require further treatment. Furthermore, IMERC involves an extra handling step for the radioactive residue.

- Both IMERC and RMERC are described in Table 1 of 40 CFR 268.42. Both descriptions state that

  > "[A]ll wastewater and nonwastewater residues derived from this process must then comply with the corresponding treatment standards per waste code with consideration of any applicable subcategories (e.g., High or Low Mercury Subcategories)."

  For RMERC, this treatment standard is explained as an additional D009 subcategory:

  > "[N]onwastewaters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the toxicity characteristic leaching procedure (TCLP) in SW846; and contain less than 260 mg/kg total mercury and that are residues from RMERC only."

  The treatment standard for this subcategory is 0.2 mg/L TCLP. For IMERC, the ash and/or control equipment media will be a newly generated hazardous waste and would therefore be required to meet the toxicity characteristic for mercury of 0.2 mg/L TCLP. The disposal standard proposed by Energy*Solutions* meets this LDR TCLP concentration in a single step.

- Successful chemical stabilization of High Mercury-Inorganic Subcategory wastes has been demonstrated to achieve a measure of performance equivalent to the required methods which require two treatment methods (RMERC and stabilization) with no detrimental effect to human health or the environment. The U.S. Environmental Protection Agency (US EPA) has issued a Determination of Equivalent Treatment (DET) for these High Mercury Subcategory wastes that were chemically stabilized. In the EPA's determination, they concluded that for waste streams that are radioactive and contain mercury, the recovery portion of RMERC may not be appropriate and that alternative treatment processes should be pursued. A copy of this letter is attached for reference.

- The US EPA has reviewed the treatment of mercury-bearing waste in a Federal Register Notice (68 FR 4481). In this notice, the US EPA concluded that treatment of mercury waste is possible and it is suggested that stakeholders should use the site specific treatment variance process to achieve approval for the treatment of high subcategory mercury wastes. The notice specifically designates an example of when this would be appropriate as the case of a high mercury subcategory waste that is also radioactive.

- Energy*Solutions* has requested similar site-specific treatment variances for High Mercury Subcategory waste in letters dated November 21, 2001; October 21, 2003; April 28, 2004; November 8, 2004; November 29, 2005; December 20, 2006; January 25, 2008; January 20, 2009; January 27, 2010; February 15, 2011; March 21, 2012; March 7, 2013; and March 4, 2014. These variance requests were approved on January 8, 2002; December 11, 2003; June 10, 2004; January 13, 2005; January 12, 2006; February 8, 2007; March 13, 2008; March 12, 2009; April 8, 2010; May 12, 2011; May 10, 2012; April 11, 2013; and April 10, 2014, respectively.

- Over the years that this variance has been granted, Energy*Solutions* and generators have consistently been successful at treating high subcategory mercury to LDR compliant levels.

This variance request consists of waste that may be shipped to Energy*Solutions* over the next year. To date, Energy*Solutions* has disposed of approximately 10,560 cubic feet of treated High Mercury Subcategory waste. From knowledge of the current market of High Mercury Subcategory Waste requiring treatment or disposal, and from past experience receiving this type of waste, Energy*Solutions* anticipates up to approximately 500 cubic feet of additional High Mercury Subcategory waste for disposal in the next year under this treatment variance.

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Energy*Solutions* requests that a variance be granted to allow the receipt and disposal of High Mercury Subcategory waste that has been treated either to the 0.2 mg/L TCLP standard for hazardous waste or the 0.25 mg/L TCLP standard for contaminated soil.

The name, phone number, and address of the person who should be contacted to notify Energy*Solutions* of decisions by the Director is:

Mr. Vern Rogers
Manager, Compliance and Permitting
Energy*Solutions* LLC
299 South Main Street, Suite 1700
Salt Lake City, UT 84111
(801) 649-2000

Should there by any questions to this request, please contact me at (801) 649-2144.

Sincerely,

Timothy L. Orton, P.E.
Environmental Engineer

cc: Don Verbica, DWMRC

enclosure

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Generator: Brookhaven National Laboratory
Generator # / Waste Stream #: ~~8000-22~~ 2016-21 JZH
Waste Stream Name: BNL Treated Mercury Soil

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

Mr. George J. Malosh
U.S. Department of Energy
Brookhaven Group Building 464
Upton, NY 11973-5000

Dear Mr. Malosh:

EPA has reviewed your request for a determination of equivalent treatment as authorized by 40 CRF 268.40(b) for the mercury contaminated waste from your facility that will be the subject of treatability studies.

Based on the information provided in your application and conversations between your staff and mine, EPA is approving the request for a determination of equivalent treatment. EPA agrees that RMERC is not appropriate for this waste, due to the generation of elemental mercury that is contaminated with radioactive materials and that has no current use via recycling. Instead, the facility will need to meet a replacement concentration-based treatment standard for this waste, which is detailed in the enclosed determination. This standard does not replace any other applicable federal, state, or local requirements as specified in the facility's waste analysis plan. Additionally, all wastes subject to this determination must be disposed at a facility permitted to accepted the radioactive elements present in the waste following treatment.

Enclosed you will find our determination on your request. If you need further assistance, please contact John Austin. Waste Treatment Branch (703/308-0436).

Sincerely yours,

Elizabeth A.
Cotsworth, Acting
Director
Office of Solid
Waste

Enclosure

cc: Jim Thompson, OWPE
RCRA Hotline

Generator: Brookhaven National Laboratory
Generator # / Waste Stream #: ~~8008-??~~ 6646 C1 JL4
Waste Stream Name: BNL Treated Mercury Soil

Determination of Equivalent Treatment
40 CFR 268.42(b)
Notification of Acceptance

Notification Number: OSW-DE016-0698

Requesting Facility: Brookhaven National Laboratory

Facility Address: U. S. Department of Energy
Brookhaven Group Building 464
Upton, NY 11973-5000

EPA Facility ID #: NY7890008975

Facility Representatives: Gail Penny, Project Manager
(516)344-3229; Email: gpenny@bnl.gov

Glen Todzia, Project Engineer
(516)344-7488

Date of Request: July 1, 1998

Waste Description for Which Replacement Standard is Sought:

The subject wastes consist of (a) treatability samples totaling 4990 kg of RCRA characteristic mercury- and radioactive-contaminated soils and (b) an unspecified amount of residues and newly generated wastes resulting from multiple treatability studies on these samples. The treatability samples are soils that are mostly sand but contain some gravel. Approximately 5% of the treatability sample wastes consists of pieces of glass, metal, and plastic. A summary waste description is given in Table 1.

The subject waste soils were excavated in 1997 from a former land disposal area ("Chemical Holes Area") for miscellaneous laboratory wastes at Brookhaven National Laboratory, in Long Island, New York. The retrieval was performed as a CERCLA removal action. Segregation of the excavated waste into two waste streams was performed by sieving with a 2-inch sieve as the waste was excavated. Only materials that passed through the 2-inch sieve are the subject of the planned treatability studies.

Basis of Request:

The subject mercury-contaminated waste soils (above 260 ppm mercury) are also contaminated with low levels of radioactive materials. The LDR technology specific treatment standard for this waste is RMERC (retorting or roasting with recovery of the mercury for reuse). Retorting or

roasting of the waste is inappropriate because any mercury recovered would still be contaminated with radioactive materials, which would prohibit its recycle or reuse as elemental mercury. The

Table 1. Initial Waste Descriptions

Waste Container ID	Approximate Volume (yd³)	Approximate Weight (kg)	Total Mercury Concentration (mg/kg)	TCLP Mercury Concentration (mg/l)	Primary Mercury Species	Other RCRA Constituents that exceed TC Regulatory Levels or are Listed Wastes	Waste Description and treatment/ Regulatory Subcategory	Assigned EPA Waste Code	Applicable LDR Treatment Standard
Bin 1	2	2495	6750	3.56	Elemental*	None Identified	Nonwastewater, High Mercury Subcategory*	D009	RMERC
Bin 2	2	2495	15,000	0.263	Elemental*	None Identified	Nonwastewater, High Mercury Subcategory*	D009	RMERC 1. Determined by visual inspection.

2. Nonwaste waters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the extraction procedure (EP) in SW 846 Method 1310; and contain greater than or equal to 260 mg/kg total mercury that are inorganic, including residues from RMERC.

elemental mercury would therefore require further treatment (amalgamation) prior to its ultimate disposal. The subject wastes are proposed to be treated by a variety of methods as part of a treatability study to evaluate treatment options for other legacy wastes within the U. S. Department of Energy (DOE) complex.

DOE has requested a Determination of Equivalent Treatment for the treated treatability study samples and any newly generated >260 ppm Hg wastes that may result from these treatability studies (i.e., treatment residues). The proposed waste disposal location for the treatability study wastes that meet the assigned substitute treatment standard (and any other applicable LDR waste treatment standards) is the Envirocare of Utah, Clive, Utah, low level radioactive waste landfill. Alternatively, the DOE Hanford Site, Richland, Washington low level radioactive waste landfill

may be used. Other landfills that become available in the future and that meet all EPA and other agency requirements (e.g., NRC, DOE, or State) for disposal of such waste may also be considered. In the absence of the requested DET replacement standard, all treatment residues would have to be re-treated by retorting or roasting. Any recovered mercury would have to be amalgamated prior to disposal as low level radioactive waste.

EPA is requested to assign a replacement mercury treatment standard of 0.2 mg/kg TCLP to these treated treatability samples and any resulting newly generated treatment residues. The treated samples and newly generated wastes from the treatability study would still be required to meet applicable existing LDR treatment standards for underlying hazardous constituents other than mercury.

Previously Applicable Treatment Standard for Which Equivalency is Granted:

Waste codes of concern			Nonwastewater
D009	Non wastewaters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the extraction procedure (EP) in SW846 Method 1310; and contain greater than or equal to 260 mg/kg total mercury that are inorganic, including incinerator residues from RMERC (High Mercury Inorganic Subcategory	Mercury	RMERC

Replacement Treatment Standards:

Waste codes of concern			Nonwastewater
D009	Non wastewaters that exhibit, or are expected to exhibit, the characteristic of toxicity for mercury based on the extraction procedure (EP) in SW846 Method 1310; and contain greater than or equal to 260 mg/kg total mercury that are inorganic, including	Mercury	0.20 mg L TCLP

incinerator residues from RMERC (High Mercury Inorganic Subcategory

Compliance with these standards, as approved below, does not relieve the facility from compliance with any other applicable treatment standards associated with these wastes. This standard does not replace any other applicable federal, state, or local requirements as specified in the facility's waste analysis plan. Additionally, all wastes subject to this determination must be disposed at a facility permitted to accept the radioactive elements present in the waste.

Authorities and References:

A Determination of Equivalent Treatment is governed by 40 CFR 268.42(b), which states: "(b) Any person may submit an application to the Administrator demonstrating that an alternative treatment method can achieve a measure of performance equivalent to that achieved by methods specified in paragraphs (a), (c), and (d) of this section....The applicant must submit information demonstrating that his treatment method is in compliance with federal, state, and local requirements and is protective of human health and the environment. On the basis of such information and any other available information, the Administrator may approve the use of the alternative treatment method if he finds that the alternative treatment method provides a measure of performance equivalent to that achieved by methods specified in paragraphs (a), (c), and (d) of this section. Any approval must be stated in writing and may contain such provisions and conditions as the Administrator deems appropriate. The person to whom such approval is issued must comply with all limitations contained in such a determination."

The above provision was further clarified in the preamble for the Land Disposal Restriction for Third Third Scheduled Wastes: Final Rule, 55 FR at 22536, (June 1, 1990) as follows: "when EPA requires the use of a technology (or technologies), a generator or treater may demonstrate that an alternative treatment method can achieve the equivalent level of

performance as that of the specified treatment method [40 CFR 268.42(b)]. This demonstration is typically both waste-specific and site-specific and may be based on: (1) the development of a concentration based standard that utilized a surrogate or indicator compound that guarantees effective treatment of the hazardous constituents; (2) the development of a new analytical method for quantifying the hazardous constituents, and (3) other demonstrations of equivalence for an alternative method of treatment based on a statistical comparison of technologies, including a comparison of specific design and operating parameters."

Justification for the Equivalent Treatment Standard:

In the context of this treatability study situation, roasting or retorting and recovery of mercury (RMERC) from High Mercury-Inorganic nonwastewater wastes does not appear to be an appropriate treatment method if the wastes are also radioactive. This is because the recovered mercury is expected to be still classified as radioactive material and as such will not be recyclable but will require further treatment prior to its ultimate disposal. Therefore, the earlier recovery step appears not to serve a useful purpose in this particular mixed waste context, and would involve additional waste handling with the attendant concerns about potential exposure to radionuclides. The requested replacement standard for the limited quantity of waste to be subject to the treatability studies is the current LDR concentration-based treatment standard for Low Mercury-Inorganic nonwastewaters that have undergone RMERC, 0.20 mg/L TCLP. Therefore, the wastes will be subject to treatment standards equivalent to those for the residues of the RMERC process, but without having to first undergo a non-useful RMERC step. This is an appropriate measure of equivalent performance and is sufficiently protective of human health and the environment in this particular situation.

Based upon the information submitted, the factors identified above, and the conditions for treatment and disposal set out above, I have determined that the petition for Determination of Equivalent Treatment submitted by DOE on May 20, 1998 is hereby granted, effective upon my signature.

Dated:

Elizabeth A. Cotsworth, Acting Director
Office & Solid Waste

Attachment I - Analytical Data for Wastes to be Subjected to the Treatability Studies

B-25 Container #1

Parameter	Concentration
Mercury (total)	6750 mg/kg
Mercury (TCLP)	3.56 mg/L
Gross Alpha	4560 pCi/g
Gross Beta	525 pCi/g
Plutonium - 238	72.6 pCi/g
Plutonium - 239/240	19.7 pCi/g

Generator: Brookhaven National Laboratory
Generator # / Waste Stream #: [illegible]
Waste Stream Name: BNL Treated Mercury Soil

Americium - 241		7140 pCi/g
Strontium - 90		2.15 pCi/g

B-25 Container #2

Parameter	Concentration	
Mercury (total)		18,000 mg/kg
Mercury (TCLP)		0.263 mg/L
Gross Alpha	24.9 pCi/g	
Gross Beta	35.9 pCi/g	
Plutonium - 238		7.06 pCi/g
Plutonium - 239/240		5.87 pCi/g
Americium - 241		28.67 pCi/g
Strontium - 90		35.5 pCi/g

Attachment 2- DOE Description of Treatment Technologies to be Included in Treatability Studies

The DOE Mixed Waste Focus Area (MWFA) Mercury Contamination Product Line Mercury Working Group (HgWG) is sponsoring demonstrations of alternative advanced technologies for treating toxicity characteristic mixed waste containing more than 260 ppm total mercury concentrations to determine which technologies can produce stable products for disposal that are acceptably protective of human health and the environment. The initial wastes and the final waste forms are to be tested using TCLP to determine if the final waste forms are no longer toxicity characteristic hazardous waste, meet the applicable replacement LDR treatment standard for mercury, and meet any other LDR waste treatment standards determined to be applicable for this waste. Informational testing to provide additional data for use by EPA will also be conducted, including measurement of mercury vapor pressure over the final waste forms, and selected additional leaching tests to be determined in coordination with EPA Office of Solid Waste. EPA's contractor Professor David Kosson (Rutgers University), Brookhaven National Laboratory (BNL), and the MWFA/HgWG.

Mercury Stabilization

A BNL sulfur polymer cement process will be one of the mercury stabilization processes demonstrated.
Commercial vendors will also be contracted to perform stabilization demonstrations. These vendors will
be selected by the HgWG through an open bidding process. Each stabilization process will have been
previously demonstrated on wastes or surrogates with less than 260 ppm total mercury concentration.

Mercury Separation

A mercury separation technology may be included in the demonstration tests. A candidate process uses a
potassium iodide/iodine leaching solution to solubilize and remove mercury. The mercury is recovered
as elemental mercury and amalgamated for disposal. The extractants are recovered and recycled. This
process has already been demonstrated for mercury levels below 260 ppm.

Mercury Retort and Amalgamation

For comparison with the results of the advanced separation and stabilization technologies, an additional
treatability study will be performed using a mobile commercial vacuum retort unit to thermally desorb
mercury, The recovered mercury will be amalgamated for disposal. This will be the baseline technology
to satisfy the existing LDR treatment standard (RMERC) for High Mercury Inorganic Subcategory waste
and the amalgamation (AMALG) treatment standard for
radioactive elemental mercury waste. Amalgamation will be by commercially available processes or by
an advanced sulfur-polymer-cement process developed and used at BNL.