Attachment
26-TWO-0057

Hanford Variance Petition

(11 pages including cover sheet)

I. PETITIONER INFORMATION

The U.S. Department of Energy ("DOE") submits this variance to the U.S. Environmental Protection Agency ("EPA") pursuant to 40 C.F.R. §268.44(a).

Petitioner and Facility Owner/Operator:
U.S. Department of Energy, Hanford Field Office
P.O. Box 450
Richland, WA 99354

Facility Location:
Hanford Facility
Benton County
Richland, WA 99354
RCRA ID No.: WA7890008967

Facility Contact:
Name: Ray Geimer
Title: Manger, Hanford Field Office

II. STATEMENT OF INTEREST

DOE's Hanford Site currently stores approximately 56 million gallons of waste in underground storage tanks. The wastes consist of both radioactive and hazardous components, referred to as "mixed waste." DOE regulates certain radioactive materials, including the radioactive portion of mixed waste at Hanford, pursuant to its sole authority under the Atomic Energy Act of 1954 ("AEA"), 42 U.S.C. §§ 2011, *et seq.,* as amended. The hazardous portion of the mixed waste is managed pursuant to the Resource Conservation and Recovery Act ("RCRA") and the regulations promulgated thereunder.

Previously, in August 2023, DOE submitted a petition to the EPA seeking a variance from the Land Disposal Restrictions ("LDR") treatment standards in relation to the 2,000-gallon Test Bed Initiative ("TBI") Demonstration (hereinafter, the "TBI Petition").[1] A copy of the TBI Petition is attached hereto as Exhibit A. EPA granted the treatment variance, authorizing DOE to treat the TBI waste to the method-based standard of stabilization, or STABL (EPA's proposed and final rules on the TBI Demonstration variance will hereinafter collectively be referred to as the "TBI Variance").[2]

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[1] *See* 88 F.R. 83065 (November 28, 2023) for EPA's proposed rule for the TBI Demonstration variance. A copy of the proposed rule is attached hereto as Exhibit B.

[2] *See* 89 F.R. 35008 (May 1, 2024) for EPA's final rule granting a variance for the TBI Demonstration. A copy of the final rule is attached hereto as Exhibit C. Note that the TBI Variance also included post-treatment confirmation sampling to verify that LDR concentration-based standards were met for applicable waste codes, for the purposes of research, demonstration, and development only. For reasons discussed herein and consistent with method-based treatment standards, post-treatment confirmation is not included as part of this variance petition.

In addition to implementation of the TBI Demonstration itself, the goal of the prior variance effort was to facilitate DOE's implementation of future alternative treatment through stabilization/solidification of mixed low-level waste ("MLLW") from Hanford tanks and dispose of grouted waste at offsite commercial facilities. In January 2025, following mediated negotiations, the Holistic Agreement was finalized between DOE, EPA and the State of Washington, which resulted in modification or creation of certain milestones in the *Hanford Federal Facility Agreement and Consent Order* ("HFFACO," also known as the Tri-Party Agreement ("TPA")) and amendments to the Consent Decree in *Washington v. Energy*, No. 2:08-cv-5085. Among those changes, new HFFACO interim milestone M-045-135 was created for the retrieval of 22 SSTs located in 241-S, 241-SX, and 241-U Tank Farms[3] in the 200 West Area of the Hanford Site by 2040, contingent on DOE having a regulatory pathway to grout and dispose of the waste offsite.[4]

As acknowledged by EPA in the TBI Variance, availability of Double-Shell Tank ("DST") space is crucial for retrieval of waste from Hanford's aging Single-Shell Tanks ("SST") and therefore integral to DOE's cleanup mission at the Hanford Site. Thus, in addition to West Area retrievals, DST space is also critical for DOE to meet its 200 East Area tank waste retrieval obligations under the amended Consent Decree and TPA. Furthermore, depending on the efficiency and throughput capability of vitrification at the Waste Treatment and Immobilization Plant ("WTP") Low Activity Waste ("LAW") Facility (which commenced hot commissioning in October 2025), there may be a need to grout pretreated tank waste currently staged in AP-Tank Farm in the 200 East Area for offsite disposal, to ensure availability of DST space and to optimize Direct Feed Low Activity Waste ("DFLAW") operations.[5]

Waste for grouting will be placed into appropriate Department of Transportation ("DOT")-compliant containers in batches for transport to one or a combination of the following offsite commercial treatment facilities for solidification/grouting:

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[3] Hanford Site tanks and tank farms are classified with a "241-" designator. From here on, the "241-" designation in tank and tank farm names will be omitted.

[4] Amendments to the Consent Decree included extension of the date for completing retrieval of SSTs A-104 and A-106 in the 200 East Area. If DOE determines that retrieval of those two tanks is not feasible by the extended deadline, then two substitute tanks from S, SX, and U Tank Farms can be retrieved. This could potentially result in a total of 24 SSTs being retrieved from S, SX, and U Tank Farms by 2040.

[5] In the current configuration, DST AP-106 provides LAW to the WTP for vitrification. This is referred to as Direct Feed Low Activity Waste ("DFLAW"). Waste from DST AP-107 is pumped through the Tank Side Cesium Removal ("TSCR") System for pretreatment and removal of key radionuclides (i.e., Cesium-137). TSCR feed can be sourced from any DST in the 200 East Area and managed to meet applicable waste acceptance requirements for TSCR. The waste that has been processed through TSCR is then transferred to AP-106, which holds only pretreated tank waste.

The TBI Demonstration's in-tank pretreatment system (ITPS) is analogous to the TSCR pretreatment system. Both serve to filter undissolved solid material and remove key radionuclides from liquid waste, thereby separating the low-level waste portion from other tank waste. Phase 1 of the DFLAW approach uses TSCR as a modular at-tank pretreatment capability; Phase 2 of the DFLAW approach will utilize the Advanced Modular Pretreatment System (AMPS) as the pretreatment capability. AMPS will also perform the same treatment functions as TSCR and the ITPS to filter undissolved solid material and remove key radionuclides from liquid waste.

- Perma-Fix Northwest ("PFNW"), located in Richland, Washington
- Energy*Solutions*, located in Clive, Utah
- Waste Control Specialists ("WCS"), located in Andrews County, Texas

As discussed in SA-05, DOE is also considering the construction and utilization of a future onsite treatment facility for pretreated tank waste.

Grouted waste will then be disposed of at Energy*Solutions* in Utah and/or WCS in Texas. If pretreated waste is grouted at PFNW (or onsite), the grouted waste form will be containerized and shipped in compliance with DOT requirements to either Energy*Solutions* and/or WCS for disposal. Thus, for all waste that is the subject of this Petition, all disposal facilities are located outside the State of Washington.[6]

III. DESCRIPTION OF THE PROPOSED ACTION AND NEED

The scope of this Petition addresses pretreated tank waste, from both 200 East Area and 200 West Area, that contains low levels of LDR organic constituents (discussed in more detail below).

a. Standard Requested – STABL

DOE seeks to establish STABL as the treatment standard for pretreated tank waste that is the subject of this Petition for all waste codes

The EPA-approved technology-based standard of STABL is described as "[s]tabilization with the following reagents (or waste reagents) or combinations of reagents: (1) Portland cement; or (2) lime/pozzolans (e.g., fly ash and cement kiln dust)…" Ibid. To comply STABL, treatment facilities are required to use the appropriate methods that meet EPA requirements in accordance with the facilities' waste permits.

A future variance for treatment of Hanford tank waste to address tank waste containing higher levels of LDR organics and to potentially effectuate a "Sample-and-Send" program that reduces and/or eliminates post-treatment confirmation sampling, is under development; this

[6] Prior to offsite shipment of any waste that is the subject of this Petition, DOE will ensure its statutory and regulatory obligations under the National Environmental Policy Act ("NEPA") are satisfied and appropriate waste determinations under the AEA are made, as applicable. With respect to 200 West Area pretreated tank waste, to date DOE has issued an Amended Record of Decision to the *Final Tank Waste Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391) for 200 West Area Tank Waste Treatment, and associated Supplement Analysis (DOE/EIS-0391-SA-05), pursuant to NEPA and DOE's Implementing Procedures. DOE has also issued the *Draft Waste Incidental to Reprocessing ("WIR") Evaluation for the 200 West Tank Waste Treatment Mission*, pursuant to DOE Order 435.1, *Radioactive Waste Management,* and DOE Manual 435.1-1, *Radioactive Waste Management Manual*. The Draft WIR Evaluation addressed the pretreatment, solidification, and offsite disposal of tank waste from all SSTs located in the S, SX, and U Tank Farms, and the management of that waste as MLLW. NEPA requirements and DOE waste classification under the AEA, as appropriate, will also be satisfied with respect to 200 East Area pretreated tank waste, prior to any offsite shipment. As noted in footnote 9 herein, only waste determined not to be high-level waste pursuant to DOE's authorities under the AEA will be treated and disposed of offsite as MLLW pursuant to the requested variance.

Petition and any resulting variance do not in any way limit DOE's future treatment and disposal options to those addressed in this Petition.

As discussed at length in the TBI Petition, DOE and the Washington State Department of Ecology ("Ecology") differ in their respective interpretations of LDR requirements, specifically the applicability of the HLVIT treatment standard. The TBI variance framework allows DOE to treat and dispose of separated MLLW fractions offsite, outside the State of Washington, without any need to resolve DOE and the State's differing interpretations.

As emphasized in the TBI Petition, it is critical to DOE that this Petition, and any resulting variance issued by EPA, do not represent a concession that the HLVIT standard applies to any mixed waste that is the subject of this Petition, or to any low-level waste fractions that may be addressed in the future under a separate petition. DOE fully reserves its rights to contest the applicability of the HLVIT treatment standard and other LDR program requirements in any future administrative or judicial context or proceeding.

b. Post-Treatment Sampling

As discussed in the TBI Petition, treatment and disposal facilities are generally required to conduct some level of post-treatment confirmation sampling, in accordance with their permits and Waste Analysis Plans, unless the applicable standard is a specified technology such as STABL. Thus, while there would typically be no post-treatment sampling where STABL is the LDR treatment standard, DOE is proposing that the treatment facility(ies) will perform post-treatment confirmation sampling to the same extent and at the same frequency required for waste treated to numerical LDR treatment standards pursuant to the Waste Analysis Plan incorporated into the facility's permit and/or license. DOE expects to utilize the sampling data obtained from post-treatment confirmation sampling to establish the technical basis to potentially reduce and/or eliminate post-treatment confirmation sampling in a future variance.

Waste treatment and disposal will be implemented pursuant to the individual licenses and permits of the respective treatment and disposal facilities, including any waste profiling and preshipment samples. Specific requirements can be found in the Waste Acceptance Criteria for each facility as well as the Waste Analysis Plan developed in accordance with 40 CFR 264.13 and incorporated into the facility's hazardous waste permit. For illustrative purposes, these requirements may include:

- Development of a waste profile with the treatment facility in accordance with the facility's Waste Acceptance Criteria and/or Waste Analysis Plan
- Supplying waste samples to the treatment facility prior to shipment if requested by the treatment facility (e.g., to develop a grout formulation). Alternatively, the treatment facility may sample incoming waste shipments in accordance with facility waste acceptance requirements as set forth in the facility's permit.
- Sampling of treated waste according to the frequency and analytical procedures in the Waste Analysis Plan to meet the requirements of 40 C.F.R. § 268.7(b) prior to disposal.

IV. JUSTIFICATION

a. Technically Inappropriate – 40 C.F.R. § 268.44(a)

Pursuant to 40 C.F.R. § 268.44(a)(2)(i), a variance may be approved if it is technically inappropriate to treat the waste to the level specified in the treatment standard, or by the method specified as the treatment standard, even though such treatment is technically possible.

Under the LDR program, EPA has long recognized grouting as an effective and acceptable treatment for inorganic constituents. For mixed waste in particular, EPA found the following:

> The Agency believes that for treatment of metals in low level mixed wastes and for some TRU mixed wastes containing low radioactive components, chemical precipitation will remove the metals in wastewaters, and stabilization technologies will reduce the leachability of the metal constituents in nonwastewater matrices. These are the same technologies that are applicable to nonradioactive wastes containing metals.
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> DOE submitted data demonstrating the applicability of stabilization as a treatment technology for the low level waste fractions that are separated from the high level waste generated during the reprocessing of fuel rods. As used by one particular facility, a stabilization process called grout stabilization involves blending commercially produced cement based reagents with the liquid low level waste fraction. The material sets up as a solid mass, immobilizing the waste. The performance data indicate[d] that stabilization provides immobilization of the characteristic metal constituents and radioactive contaminants for this low level radioactive waste, and that it is possible to stabilize the RCRA hazardous portions to meet the treatment levels for the characteristic metals.
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> [55 F.R. 22520, 22626-22627 (June 1, 1990).]

Accordingly, DOE is proposing STABL to immobilize the characteristic inorganic constituents in the pretreated MLLW that is the subject of this Petition, which EPA affirmed in the TBI Variance.[7]

[7] *See* 88 F.R. 83069.

Similar to TBI, sampling of waste from the AP Farm in the 200 East Area and SY Farm in the 200 West Area shows that LDR organic constituents in the waste, prior to any stabilization/immobilization, are generally low (i.e., either not present, or not expected to be present, at levels that require targeted treatment of organics through destruction or removal). Therefore, as EPA concluded in the TBI Variance, it would be technically inappropriate to require any destruction or removal of organics in addition to stabilization/immobilization.[8]

EPA has previously acknowledged that treatment for organic contaminants may be technically inappropriate "when a waste contains low concentrations of non-volatile organic contaminants (for example, concentrations slightly exceeding a Universal Treatment Standard) and the waste, for legitimate reasons, has been stabilized." 62 F.R. 64504, 64505 (December 5, 1997). For purposes of this Petition, pretreated tank waste is being stabilized/grouted for the legitimate purpose of immobilizing inorganic constituents present in the waste. Thus, targeted treatment of low concentrations of organic constituents via removal or destruction is technically inappropriate where those constituents would be present in the final waste form at concentrations below their applicable NWW concentration-based treatment standards.

As discussed in the TBI Petition, DOE is not asking EPA to opine on whether the waste subject to this Petition is required to comply with the HLVIT treatment standard, which is the State of Washington's position. DOE is also not conceding by submittal of this petition that the HLVIT requirement applies to any pretreated tank waste that will be stabilized/grouted and disposed of pursuant to this requested variance. Rather, this Petition establishes that, even under Washington's interpretation of LDR requirements, it would be technically inappropriate to require vitrification of separated low-level waste fractions.

The reasons it would be technically inappropriate under RCRA to require vitrification of separated low-level waste fractions as a general matter are set forth at length in the TBI Petition (for brevity, those discussions will not be repeated in their entirety here; DOE respectfully directs EPA to the discussion in the TBI Petition at p. 11-13 and in EPA's proposed variance rule, 88 F.R. 86039-86070). For pretreated tank waste, DOE emphasizes in particular that in contrast with low-temperature stabilization/immobilization of waste, requiring vitrification would result in unnecessary and avoidable secondary impacts, including generation of secondary liquid waste that requires additional treatment that is both time-consuming and cost ineffective. *See* 88 F.R. 83070.

[8] Nothing herein precludes a treatment facility from utilizing a treatment step prior to incorporation of the waste in the final solid form, to ensure the numerical NWW treatment standards for all constituents are met in the final waste form prior to disposal. For example, a treatment facility may elect to apply chemical reduction for the targeted treatment of specific inorganic constituents, such as chromium, or chemical oxidation to destroy organic constituents. This will depend on the specific grout formulations and treatment techniques utilized by the individual facilities, which is typically proprietary information, and will thus be at the discretion of the treatment facility to ensure LDR constituents are below their numerical standards in the final waste form and that they are treating the waste in accordance with their permits and applicable regulatory requirements. Post-treatment confirmation sampling under this proposed variance as required by the applicable facility Waste Analysis Plan and permit will ensure that the treatment and grout recipes applied by the treatment facilities result in all LDR constituents meeting numerical LDR treatment standards in the final solidified waste form.

DOE also emphasizes EPA's recognition of the fact that high- and low-level waste fractions can be separated and that the amount of waste requiring vitrification could be reduced through stabilization/immobilization of low-level radioactive waste. EPA addressed this specifically when promulgating the Third Third Rule:

> DOE provided information to support that vitrification is an applicable technology for their high-level wastes generated from the reprocessing of fuel rods. Treatment can be accomplished by using either direct vitrification or a more complex treatment process which includes a series of chemical steps that separate the low-level radioactive waste fractions from the high-level radioactive waste. The high-level radioactive portion is then vitrified. When using separation technologies such as precipitation followed by settling or filtration, the bulk of the radioactivity can be incorporated into a high-level liquid waste containing up to 99 percent of the radioactivity of the original irradiated fuel rods. By separating high- level and low-level mixed wastes, the amount of high-level waste that may require vitrification treatment can be reduced. (emphasis supplied).
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> [55 F.R. 22520, 22627 (June 1, 1990).]

b. Minimize Threats to Human Health and the Environment – 40 C.F.R. § 268.44(m)

RCRA regulations also require a demonstration that compliance with a proposed treatment standard is sufficient to minimize threats to human health and the environment posed by land disposal of the waste. 40 C.F.R. § 268.44(m).

Treatment of pretreated tank waste to the requested standard would satisfy the above criterion. As discussed above, EPA has concluded that stabilization/immobilization is an appropriate technology for low-level waste fractions that are separated from high-level waste fractions. Grouting has also long been considered Best Demonstrated Available Technology ("BDAT") for inorganic constituents in mixed waste and is therefore expected to immobilize any inorganic constituents and therefore minimize threats, and CHRED is acknowledged in the LDR regulations as a common method of treating chromium. Moreover, while specific recipes may vary (and recipes for commercial facilities are typically proprietary), commercial treatment facilities would be required to develop and use appropriate treatment methods that meet regulatory requirements in accordance with the facilities' permits and licenses.

With respect to LDR organic constituents, available sampling data shows that all organics are below or just above their respective NWW numerical standards. In addition, only pretreated tank waste with organics at levels that will be below their respective NWW numerical standards

in the final grouted waste form will be disposed of offsite in accordance with this variance; therefore, targeted organics destruction or removal in addition to grouting is not necessary to minimize threats to health and the environment.

Furthermore, DOE will be utilizing an offsite commercial treatment facility, or a combination of treatment facilities, that is properly licensed and permitted by the applicable regulatory authority. The disposal facility(ies) to be authorized under this Petition (Energy*Solutions* and WCS) are, as EPA found in the TBI Variance, particularly appropriate for the subject waste. Both Energy*Solutions* and WCS are RCRA-permitted and licensed by the applicable State authorities to accept mixed low-level waste in accordance with their waste acceptance criteria and requirements. Those facilities are subject to regulations and conditions that ensure the protection of public health and safety and the environment, and waste will not be transported to an offsite facility unless that waste meets the waste acceptance criteria and requirements of the receiving facility. Additionally, the disposal facilities were specifically selected based on their location, geology, hydrogeology, and experience in receiving comparable waste types for disposal. The specific features of the Energy*Solutions* and WCS facilities that ensure minimization of threats to human health and the environment are discussed at length in the TBI Petition and the TBI Variance (*see* 88 F.R. 83071).[9]

Based on the above, this Petition satisfies the criteria at 40 C.F.R. §268.44(a)(2) and (m), under either DOE or Washington's interpretation of LDR treatment requirements.

[9] Only waste determined not to be high-level waste pursuant to DOE's authorities under the AEA will be treated and disposed of offsite as MLLW pursuant to the requested variance. While outside the scope of this Petition, the radionuclide concentrations in waste after pretreatment are expected to be below the concentration limits for Class C LLW waste (and can be disposed of at Energy*Solutions* or WCS). DOE expects that some waste will also meet Class A LLW concentration limits for disposal at Energy*Solutions*.

V. PROPOSED MODIFICATION TO TABLE AT 40 C.F.R. § 268.44(o)

Bolded/underlined *language represents new language to be inserted.*
~~*Strikethrough*~~ *language represents language to be deleted.*

Wastes Excluded from The Treatment Standards Under § 268.40							
				Wastewaters		Nonwastewaters	
Facility Name and address	Waste Code	See also	Regulated hazardous constituent	Concentration (mg/L)	Notes	Concentration (mg/L)	Notes
United States Department of Energy (Energy), Richland, WA [17]	F001-F005 D001-D003, D004-D011, D018, D019, D022, D028-D030, D033-D036, D038-D041, and D043[18]	NA	For waste codes F001-F005, the constituents are limited to those associated with spent solvent activities at the Facility documented through process knowledge. For constituents, as appliable, associated with D waste codes under the "Waste Code" column, see 40 C.F.R. § 268.40.	NA	NA	STABL[19, 20]	NA

[17] – The STABL treatment standard applies to the separated and pretreated tank waste **from the Hanford Site that will be disposed of outside the State of Washington** ~~under the 2,000-gallon TBI Demonstration~~.

[18] – The waste codes included in this column are those identified on the current version of the Dangerous Waste Permit Application Part A Form for the Hanford Double Shell Tank System, **DST-2025-01 (February 24, 2025)**~~Rev. 04 (December 14, 2009)~~ except for F039 which has not been accepted into the Double-Shell Tanks.

[19] – Sampling after treatment will be conducted at the treatment facility **to the same extent and at the same frequency applicable to waste that is treated to numerical treatment standards under the facility's Waste Analysis Plan and permit to meet the requirements of 40 CFR 268.7(b). Sampling will assess** ~~for the purpose of assessing~~ the extent of treatment performance against the **non-wastewater** ~~NWW~~ numerical standards at 40 CFR 268.40 and, as applicable, at 40 CFR 268.48. Waste treated using STABL may not be land disposed **unless** ~~until~~ LDR constituents are below the non-wastewater numerical standards at 40 C.F.R. 268.40 and 268.48.

[20] – Treatment using the STABL treatment method shall be performed~~, and~~ **at a treatment facility (or combination of treatment facilities) that is properly permitted and licensed to accept and treat the waste. T**~~t~~he treated waste shall **also** be disposed of at offsite commercial disposal facilities **(**Energy*Solutions* in Clive, Utah, and Waste Control Specialists in Andrews County, Texas**)**.

VI. CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

RAYMOND GEIMER

Digitally signed by RAYMOND GEIMER
Date: 2026.07.06 10:18:21 -07'00'

Ray Geimer, Manager
Hanford Field Office
U.S. Department of Energy

Date