Relabeling and Grouting Tank Waste at Hanford

Frequently Asked Questions

April 2021

Question: What is reclassification of high-level waste?

Answer: How nuclear waste is classified determines what rules/restrictions apply to final disposal of that waste. The rules currently require waste at Hanford that is classified as high-level waste (HLW) be immobilized in glass through vitrification and buried in a deep geological repository. The Department of Energy (DOE) wants to reclassify HLW as "other than HLW" so that DOE has more options for treating and disposing of the HLW at Hanford. For example, to close the tank farms where this waste is stored, DOE wants to reclassify any waste remaining in the Hanford tanks and leave the waste in the tanks rather than removing and treating it.

Question: What does grouting tank waste mean?

Answer: Grout is similar to concrete. The Department of Energy (DOE) is considering using grout for two purposes, one for tank closure where grout would be used to fill mostly emptied tanks and they would be disposed in place; and one as an alternative to the current immobilization in glass plan for treating waste that has been removed from the tanks. It is also possible that DOE will choose to simply grout tanks in place. DOE issued a report to Congress expressing that it could save money by grouting tank waste.

Question: How much tank waste needs treatment? What is the plan for treatment?

Answer: There are 56 million gallons of high-level waste in Hanford's 177 underground storage tanks. There is other known and potential high-level waste on the Hanford site that could be impacted by DOE's reclassification attempts, but this FAQ is focused on the HLW in Hanford's underground storage tanks.

The plan has always been to separate the Hanford high-level tank waste into two waste streams – the low-activity waste stream and the high-activity waste stream. The low-activity waste stream (containing roughly 10% of the radionuclides) would have key radionuclides removed, be vitrified, and be buried onsite at the Integrated Disposal Facility. The high-activity waste stream (containing 90% of the radioactivity) would be vitrified and sent to a licensed geologic repository.

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The original plan had both the low-activity and high-activity waste streams vitrified into glass at the Waste Treatment Plant. But because the Waste Treatment Plant has faced decades of delays and technical issues, a new plan to vitrify part of the low-activity waste stream into glass faster was formed. The new plan is called Direct Feed Low Activity Waste and will use a pre-treatment plant called the Tank Side Cesium Removal System to remove cesium, and then will send the treated low-activity waste to the Low Activity Waste Facility to at least start vitrifying some of the low-activity waste in glass by August of 2024.

But the existing Waste Treatment Plant's facilities are only designed to treat 40-50% of the existing inventory of tank waste in glass. The remaining waste, referred to as "Supplemental Low-Activity Waste," will need another yet-to-be-decided treatment plan. The Department of Energy (DOE) has been pushing for this waste to be mixed with grout instead of vitrified.

There are two other aspects that need to be remembered. First, removing tank waste is difficult and DOE—and its contractors—have been unable to get all of the waste out of the tanks it is emptying for closure. There is controversy over how much waste needs to be removed from the tanks prior to closure – some parties want most of the waste removed and some parties argue some waste can be left. Depending on how this process is managed, DOE could try to leave hundreds of thousands of gallons or more of untreated high-level waste in the tanks forever.

Second, there are also over 1 million gallons of high-level waste that leaked under the tanks, sitting in the ground. This waste is also controversial, with DOE claiming it is no longer high-level waste because it is no longer in the tanks. No plans exist to go after this waste despite pressure from groups like Hanford Challenge and others that this waste needs to be addressed so it doesn't continue to spread.

Question: Why does Hanford Challenge oppose the Department of Energy's (DOE's) plan to reclassify and grout Hanford tank waste?

Answer: Hanford Challenge primarily opposes two specific proposals related to reclassification and grouting of Hanford tank waste.

DOE Order 435.1 – Waste Incidental to Reprocessing Rule (WIR): Part of this WIR rule is meant to cover materials such as clothing, equipment, and rags that came into contact with high-level waste and were thus "incidentally" contaminated. DOE calls this the "citation method." A second part of the rule, the "evaluation method", is being used by DOE to declare untreated tank waste itself as subject to WIR. This would allow DOE to complete tank farm closure by leaving some waste in the tanks and filling the tanks with grout, as it has proposed to do with the C Farm tanks.

But DOE has used the much more informal WIR citation process to declare untreated tank waste that has leaked from the tanks as low-level waste. In Hanford Challenge's view, this is a clear abuse of the process. The GAO noted, in a 2021 report:

> "Process for evaluating soil contamination. DOE and Ecology disagree about what process DOE should use to evaluate contaminated soil at the C-farm. Specifically, DOE used the less stringent WIR citation process to evaluate the contaminated soil at Hanford tank farms. However, Ecology officials told us that Ecology has advocated for a more rigorous process, such as the WIR evaluation process or the process called for in Section 3116 of the National Defense Authorization Act for Fiscal Year 2005 to be applied to the contaminated soil. In 2008, DOE made a determination using the WIR citation process that the soil contaminated with tank waste at Hanford would be classified as low-level waste. DOE made this determination at the Hanford site-level without external consultation or public notice, which DOE officials stated was in accordance with its WIR citation process.
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> DOE reaffirmed this decision most recently in January 2020. In a 2018 letter to DOE, Ecology officials stated that the WIR citation process cannot be used for contaminated tank farm soil, and Ecology asserted that DOE should use a more rigorous process, such as the WIR evaluation process, to evaluate contaminated soil as it does for residual tank waste."

- 2021 GAO Report: DOE's Efforts to Close Tank Farms Would Benefit from Clearer Legal Authorities and Communication, p. 27 -28.

In 2002, the Confederated Tribes and Bands of the Yakama Nation (Yakama) and Natural Resources Defense Council (NRDC) challenged Order 435.1 in federal court. The federal district court ruled in favor of the Yakama and NRDC, but the federal court of appeals reversed and concluded that it was too early to determine the legality of the Order.

DOE is currently using the WIR determination process to reclassify the 70,000 gallons of high-level waste it has determined it cannot remove from the tanks in C-Farm. Hanford Challenge (and many others) opposes leaving 70,000+ gallons of untreated high-level waste containing 500,000 curies of radioactivity in the C-Farm tanks and filling these tanks with grout. A final WIR determination for C-Farm has yet to be issued.

A 2003 Federal Court decision found that the 435.1 WIR evaluation process was invalid and contrary to the statute. The court found:

> "DOE's Order 435.1 directly conflicts with NWPA's definition of HLW. NWPA's definition pays no heed to technical or economic constraints in waste treatment. Moreover, NWPA does not delegate to DOE the authority to establish alternative requirements" for solid waste. Because Congress has spoken clearly on that subject, "that is the end of the matter," *Chevron*, 467 U.S. at 842, leaving no room for "alternative requirements." Thus, DOE's Order 435.1 must be declared invalid under *Chevron*."[1]

1 *National Resources Defense Council v. Abraham*, 271 F. Supp. 2d 1260 (D. Idaho 2003), at 1266.

Although the Ninth Circuit voided the District Court's decision on the basis of "ripeness," it did not overturn the reasoning of the District Court.

The cleanup agreement with the State of Washington requires DOE to remove the maximum amount of tank waste possible OR 99%, whichever is greater[2] prior to closing the tanks. Currently, DOE is proposing to comply with this requirement by removing most of the tank waste and adding grout on top of what is left. The tank farm would be capped, covered, and monitored. There are major problems with this proposal, such as the sludge at the bottom of the waste contains a much higher portion of radionuclides than other parts of the waste.

Federal Register Reinterpretation: The second specific proposal Hanford Challenge opposes is the DOE's 2018 Federal Register Reinterpretation of the Nuclear Waste Policy Act to allow DOE the authority to reclassify high-level waste. The reinterpretation was incorporated into DOE's Radioactive Waste Management Manual, DOE Order 435.1 in Jan 2021 and by allowing DOE to reclassify high-level waste on its own, removes the Nuclear Regulatory Commission's role that currently is required under federal law to reclassify high-level waste following removal of key radionuclides[3].

The Federal Register notice reinterpretation gave examples that made it clear that DOE could apply the reinterpretation to include untreated tank waste, based on unreviewable factors, and without State or other regulatory oversight. This would allow DOE to dispose of tank waste in near-surface, shallow land burial sites[4], which is something DOE has indicated interest in doing.[5]

Hanford Challenge is concerned that DOE could have a legal avenue to grout high-level waste in tanks, abandon the waste, and walk away from cleanup if DOE is allowed to exercise the power to reclassify Hanford tank waste through either proposal mentioned above—the WIR process or the Federal Register Reinterpretation. This concern is supported by the December 2020 Report to Congress from DOE stating that 80% *or more* of Hanford's tank waste could be reclassified and grouted.[6]

Ideally, Hanford Challenge would like to see DOE commit to remove and vitrify as much waste as possible from the tank farms.

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[2] *See* U.S. Department of Energy Final Tank Closure and Waste Management Environmental Impact Statement Summary, p.6

[3] See, NRC, 2001, "Overview and Summary of NRC Involvement with the DOE in the Tank Waste Remediation System-Privatization (TWRS-P) Program", NUREG-1747, U.S. Nuclear Regulatory Commission, Washington, D.C., June 29, 2001, p. 215: "Under the present system, unless the NRC determines that this LAW/incidental waste is not HLW, the waste must be disposed of as HLW in a federal repository."

[4] See, DOE Order 435.1-1IV-17-09-99 Chapter IV Low-Level Waste Requirements, Radioactive Waste Management Manual.

[5] *See* U.S. Department of Energy *Evaluation of Potential Opportunities to Classify Certain Defense Nuclear Waste from Reprocessing as Other than High-Level Radioactive Waste*, Report to Congress, December 2020, p. iv.

[6] *Id.*, at 24.

Question: Has the State of Washington taken any positions on the Federal Register Reinterpretation?

Answer: Yes. The State of Washington has weighed in heavily against the Department of Energy (DOE) Federal Register Reinterpretation.

In a public comment[7] filed on January 9, 2019, the Washington State Department of Ecology stated:

> "DOE's new interpretation could amount to DOE putting grout on the most dangerous waste in the country and walking away. Washington is unwilling to allow future generations to bear this risk simply because DOE has concerns with costs." Ecology Comment, p. 5.
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> "The proposed interpretation is contrary to Congressional intent and would fundamentally change the definition of HLW that has been consistently used by DOE and NRC [Nuclear Regulatory Commission]. The proposed change would:
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> - Change existing disposal pathways for nuclear reprocessing wastes that have been established as legal obligations in agreements between DOE and other governmental agencies and by court order.
> - Avoid public participation in the management of waste.
> - Remove oversight of the DOE's nuclear reprocessing waste management.
> - These outcomes are not acceptable to the State of Washington. We urge DOE to withdraw its proposed new interpretation." Ecology Comment, p. 7.

And a letter signed by both Washington Governor Jay Inslee and Washington State Attorney General Bob Ferguson succinctly stated:

> "Yet, we have heard DOE officials indicate that the new high level waste interpretation is a way to change current cleanup plans in order to reduce costs. At Hanford, this can only mean one thing: a cleanup that provides less protection for workers and nearby residents from the harmful chemicals and long-lived radionuclides in Hanford's high level waste. This will inevitably involve DOE proposals to leave waste in tanks and walk away, leaving the Columbia River and the surrounding community with unacceptable levels of risk. Any cleanup less robust than the one DOE committed to in the Tri-Party Agreement and the consent decree will be unacceptable to the State of Washington."[8]

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[7] *State of Washington Comments on U.S. Department of Energy's Proposed Interpretation of the term "High Level Radioactive Waste" in the Nuclear Waste Policy Act (83 FR 50909)*, Washington State Department of Ecology, January 4, 2019.

[8] *State of Washington Comments on U.S. Department of Energy's Proposed Interpretation of the term "High Level Radioactive Waste" in the Nuclear Waste Policy Act (83 FR 50909)*, Washington State Governor and Washington State Attorney General, January 7, 2019.

Question: Does Hanford Challenge categorically oppose reclassifying high-level waste (HLW)?

Answer: No. There are circumstances and scenarios where reclassification of HLW may be appropriate. In fact, the law currently allows only the Nuclear Regulatory Commission to reclassify HLW at Hanford and only in particular circumstances.[9] Hanford Challenge believes that the reclassification of HLW is more acceptable where:

- There is a presumption that HLW (which include long-lived radionuclides and chemicals) will be vitrified and buried in a deep, geological repository;
- There is an agreed-upon understanding that long-lived radionuclides presumptively require disposal in a geological repository;
- The use of reclassification is used in "special and unusual" circumstances – not wholesale to reclassify substantial portions of HLW and never for expediency or economic cost-savings reasons;
- The HLW has been treated and key radionuclides have been removed;
- An independent entity (such as a new agency or commission created for the purpose of nuclear waste disposition) makes the determination to reclassify the waste;
- There has been an open, transparent, and inclusive process involving interested stakeholders;
- The State of Washington and the affected tribal nations concur;
- There is a comprehensive report specifying what waste volumes/concentrations are being left at Hanford, for how long, and why;
- An assessment of the cumulative impact on the environment and future generations is prepared and made publicly available; and
- There is a judicial process available for aggrieved parties to challenge a determination in federal court.

Question: Has science weighed in on the reclassifying and grouting of tank waste?

Answer: Yes, many respected organizations have issued reports that consider the idea of reclassification and grouting, but none have fully endorsed reclassification and grouting of tank waste without lots of conditions.

The Blue Ribbon Commission, while endorsing the concept of revamping waste classifications in limited circumstances, stated in a 2012 report that the current approach to classification "appears to be working" and that "though many stakeholders believe the time has come for an overhaul of the U.S. waste classification system, there is also considerable concern that changes

[9] See, NRC, 2001, "Overview and Summary of NRC Involvement with the DOE in the Tank Waste Remediation System-Privatization (TWRS-P) Program", NUREG-1747, U.S. Nuclear Regulatory Commission, Washington, D.C., June 29, 2001, p. 215: "Under the present system, unless the NRC determines that this LAW/incidental waste is not HLW, the waste must be disposed of as HLW in a federal repository."

could have unintended consequences—especially considering the complex web of laws and regulations that rely on the current system." -- 2012 BRC report, at p. 98.

The 2005 National Academy of Sciences report does not categorically support reclassifying and grouting tank waste at Hanford. To the contrary, the report states: "It will perhaps be helpful to keep in mind two guiding principles in evaluating all requests for exemptions. First, the regulatory system as a whole starts from a preventive, protective baseline that prefers permanent geologic disposal as the technique for reducing present and (especially) future risks of highly hazardous wastes. Second, *the exemptions should be special, unusual circumstances*. If most or even a major portion of the HLW or TRU waste streams were legitimately granted exemptions, it would call into question the validity of the general rule." National Academy of Sciences Report, at 39.

In 2005, the National Academy of Sciences puts an emphasis on sound process and transparency: "Recommendation 1: The nation should pursue a formal, well-structured, risk-informed approach to consider what parts of the waste types …, if any, should be disposed in some manner other than deep geologic disposal. Recommendation 2: The Department of Energy (DOE) should not attempt to adopt these changes unilaterally. Likewise, the exemption process that the committee recommends must be implemented in the context of DOE's existing or renegotiated compliance agreements."[10]

The 2017 Government Accountability Office (GAO) report that is often cited to support the reclassifying of high-level waste is vague at best. Instead of reaching its own conclusions, the GAO report cites a report from the National Academy of Sciences and makes an economic argument about cost-savings and efficiency. Here is the relevant section in the GAO report: "In 2006, the National Academy of Sciences (the Academy) reported that the nation's cleanup approach—primarily carried out by DOE among other agencies—was complex, inconsistent, and not systematically risk-based. The Academy concluded that by working with regulators, public authorities, and local citizens to implement risk-informed practices, waste cleanup efforts can be done more cost-effectively. The report also suggested that statutory changes were likely needed." 2017 GAO Report.

The 2011 MIT report was mostly concerned with commercial nuclear spent fuel disposal, though there was a section on waste disposal that touched upon defense wastes. The MIT study recommended a risk-based waste management strategy should be adopted with a waste classification system based on the radionuclide, chemical, and physical characteristics of each waste stream with corresponding disposal facilities for each category of wastes. Implementation will require both regulatory and statutory actions.

MIT also recommended that the United States create an independent organization (with no additional responsibilities) for the management of all long-lived radioactive wastes. The MIT

[10] *Risk and Decisions About Disposition of Transuranic and High-Level Radioactive Waste*, The National Academy of Sciences, 2005, at 85.

report further noted that ***the safe disposal of high-level waste has long been acknowledged to be disposal in a deep geological repository***. – 2011 MIT Study on The Future of Nuclear Fuel Cycle, p. 55-59.

Question: How does the current source-based definition of high-level waste (HLW) define the hazard?

Answer: HLW is defined by the Atomic Energy Act of 1954 as the "first cycle raffinate" from a nuclear fuel reprocessing plant - the original source of HLW. ("Raffinate" is the portion of an original liquid that remains after other components have been dissolved by a solvent.) Long-lived radioactive wastes cannot be practically destroyed; thus, all fuel cycles require a geological repository to support the disposal of radioactive wastes. The current definition has built in checks and balances that provide oversight and accountability of the Department of Energy's authority to manage this waste.

Question: Shouldn't we be treating nuclear wastes based on their radioactive content, not the source of the wastes?

Answer: We are treating nuclear wastes based on their radioactive content. The definition was created to deal with an extremely radioactive and chemical hazard that had not existed prior to its creation, thus the source is the basis of the definition. Definitions of radioactive waste have become more complex as more types of radioactive waste were created. The current classification of wastes does consider content-based issues. For example, the Nuclear Regulatory Commission has the power to reclassify high-level waste in certain circumstances – particularly after waste is treated such that its radioactive content is significantly decreased. As previously noted, the Blue Ribbon Commission has stated that the current approach to classification "appears to be working" and that "though many stakeholders believe the time has come for an overhaul of the U.S. waste classification system, there is also considerable concern that changes could have unintended consequences—especially considering the complex web of laws and regulations that rely on the current system." -- BRC report, at p. 98.

Question: What commitments have been made for vitrifying Hanford's tank waste?

Answer: The State of Washington, the EPA, and the Department of Energy entered into a cleanup agreement in 1989 called the Tri-Party Agreement. The Tri-Party Agreement sets forth a series of cleanup deadlines, or milestones, that require that tank waste at Hanford be removed from the tanks and vitrified. The vitrification process envisioned the creation of two different waste streams: a low-activity waste stream that had been stripped of key radionuclides and high-level waste streams, containing 90% of the radioactivity, that required vitrification and shipment offsite to a licensed geological repository. The low-activity waste, containing roughly 10% of the radionuclides, would also be vitrified, but would be buried onsite in a monitored and lined trench called the Integrated Disposal Facility.

Question: What are your objections to grouting Hanford's tank waste?

Answer: There are several unresolved scientific and engineering objections to grouting Hanford tank waste.

1. *Waste Chemistry Uncertainty*: There is no complete laboratory analysis of what is in the 177 massive underground nuclear waste storage tanks that contain HLW at Hanford. Tank waste samples, even core samples provide some information, but it is still a limited view of what is in an individual tank.

2. *Past Failures*: The track record for successfully grouting nuclear waste is limited, and some historic grouting operations have failed, in part from unpredictable grout-setting behavior in poorly-characterized mixtures of chemical and intensely-radioactive wastes.

3. *Uncertain Behavior of Waste Post-Burial*: DOE has stated that the chemical form and behavior of grouted waste in shallow burial, particularly where plutonium is involved, is unknown[11]. It's assumed that grouted waste will leak into surrounding soils, possibly soon after burial. DOE can't actually predict what chemical form these leaks will take or how they'll behave.

4. *HLW Separation Technology Uncertainties*: The critical ability to separate low-level waste from high-level wastes in underground storage tanks is speculative.

5. *Waste in Shallow-Burial May Not Stay Put*: Successfully containing grouted waste for long-term storage in shallow burial is highly suspect, particularly if increased rainfall related to climate change, or future changes in land use and population are considered.

6. *Nuclear Proliferation/Security Risks*: Unmonitored non-retrievable storage of plutonium-containing grout units represents a nuclear proliferation and a nuclear waste security risk.

For more information, about Hanford's Challenge's response to the DOE report to Congress on grouting 80% of Hanford's tank waste, see: *Grouting 80% of Hanford's Tank Waste?*

Question: What do we know and not know about the contents of the tanks?

Answer: Complete characterization of the tank waste is a necessary element for making sound disposal decisions. Currently, there are many questions still outstanding about what elements are present in the waste and in what quantities and how waste will be mixed as it is transferred from the tanks for treatment. Hanford is conducting core-sampling programs of the tanks that appear to be going well, so answers may be forthcoming before too long. Much of the

[11] See, *Hanford Challenge Joint Comments on the C-Farm WIR*, Appendix A, p. 66.

information about the contents of the tanks is incomplete and is based on limited tank samples, institutional knowledge, and process records.

Question: What is 3116? And what could happen if it is applied at Hanford from Hanford Challenge's perspective?

Answer: Section 3116 of the National Defense Authorization Act was passed by Congress in 2005. This provision applies only to South Carolina and Idaho and sets forth a framework for the Department of Energy (DOE) to use an internal procedure to reclassify high-level waste. Specifically, 3116 says:

> "…the term 'high-level radioactive waste' does not include radioactive waste resulting from the reprocessing of spent nuclear fuel that the Secretary of Energy, in consultation with the Nuclear Regulatory Commission determines – 1. does not require permanent isolation in a deep geologic repository for spent fuel or high-level radioactive waste;
> 2. has had highly radioactive radionuclides removed to the maximum extent practical; and 3. A. does not exceed concentration limits for Class C low-level waste as set out in section 61.55 of title 10, Code of Federal Regulations."

If 3116 were to be amended to include Washington State (and thus Hanford), then DOE would only need to "consult" with the Nuclear Regulatory Commission and State of Washington. Critics of 3116 are deeply concerned that DOE will simply check the "consultation" box and then do what it clearly set out to do in the first place: reclassify tank waste as much as it pleases. In that instance, the State of Washington and everyone else would have no ability to ask a court to hold DOE accountable, as 3116 would give DOE unilateral authority to make the decision. To Hanford Challenge, this is a pathway for DOE to simply decide, for largely economic concerns, to leave the majority of Hanford's tank waste at the Hanford site, essentially forever.