Oregon
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November 25, 2020

U.S. Department of Energy
Attn: Jennifer Colborn
P.O. Box 450, MSIN H6-60
Richland, WA 99354

Sent via email: VLAWDraftWIR@rl.gov

RE: Oregon Department of Energy Comments on Draft Waste Incidental to Reprocessing Evaluation for Vitrified Low-Activity Waste

Dear Jennifer Colborn,

Thank you for this opportunity to provide comment on the US Department of Energy's (DOE) Draft Waste Incidental to Reprocessing (WIR) Evaluation and accompanying Performance Assessment for the Vitrified Low Activity Waste (VLAW) planned to be generated at the Hanford Waste Treatment Plant.

The State of Oregon retains a long-term interest in the safety and value of the Columbia River, which is the receptor of subsurface contamination at Hanford. The DOE's decision whether to classify the VLAW as low-level waste via a WIR determination has the potential to directly threaten the Columbia River by allowing wastes to remain onsite that otherwise by law would have to be disposed of in a deep geologic repository offsite.

As was mentioned in Oregon's October 4, 2018 comments on the WIR for Waste Management Area C, Oregon joined litigation against DOE in 2002 after it first promulgated DOE Order 435.1, the Directive that introduced the WIR process.[1] This decision to join the litigation at that time was made for several reasons: because we believed DOE Order 435.1 failed to follow the statutory definition of high-level waste; the "evaluation method" of the order provided DOE with unlimited discretion to determine whether high-level waste was required to be disposed of in a deep geologic repository; and Oregon wanted to ensure that it had continued access to these discussions.

Waste retrieved from the tanks and sent to the Waste Treatment Plant for vitrification originates directly from the reprocessing of spent nuclear fuel to produce plutonium for the nation's nuclear weapons program. By definition, this is high-level waste if the solids produced from such waste contains radionuclides "in sufficient concentrations." However, Oregon recognizes that the three WIR criteria (as established in DOE Manual 435.1-1 Chapter II, section B(2)(a)) originated from a series of conversations between the DOE and Nuclear Regulatory Commission (NRC) in the 1990s focused on the concept of

[1] https://www.oregon.gov/energy/safety-resiliency/Documents/2018-10-4-ODOE-Comments-WIR-Proposal.pdf

splitting the tank waste into a high-level and low activity fraction,[2] and that a rational approach to long-term radioactive waste management also considers the risk a waste poses to potential future receptors rather than the pedigree of the waste alone. In essence, the VLAW glass is what the WIR process was designed to address.

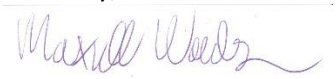
As outlined in this letter, and in consideration of our specific comments, suggestions, and questions, Oregon does not object in concept to DOE's attempt to test its Order 435.1 process for WIR determinations, in part because the plan for Hanford tank waste treatment system depends on the ability to segregate reprocessing waste into different disposal pathways following in depth analysis and stakeholder buy-in. As we said in our 2018 letter, if the results of a rigorous and scientifically-defensible analysis show that there is a reasonable expectation for minimal risk to future onsite receptors and the Columbia River, and DOE engages in an inclusive and integrative process of uncertainty management, then Oregon will respect that result.

Oregon continues to support vitrification of tank waste at Hanford. The WIR evaluation and supporting documentation appear to make a defensible case that the vitrified low activity waste would present minimal risk to human health or the environment if permanently disposed onsite at Hanford. Furthermore, the inclusion of the NRC as an independent technical peer reviewer of the WIR evaluation and the accompanying long-term performance assessment inspires confidence that the decision is being made in consultation with independent expertise from outside DOE. The depth of thought both in terms of technical rigor and public process will increase the trust of the people of Oregon that DOE is conducting a thorough assessment that will result in the best decisions for final disposition of the waste and ultimately taking a major step forward in the ongoing cleanup mission at Hanford. However, we do have some concerns that we would like to see addressed prior to final WIR determination for these wastes, summarized here and further discussed in Attachment 1 below.

- Additional discussion of Tc-99 and I-129 is warranted, specifically efforts made to remove these mobile constituents from wastes designated for IDF
- Inclusion of all wastes associated with the Direct Feed Low Activity Waste mission in this WIR Evaluation
- Inclusion of pessimistic "compound uncertainty" including poor performing glass, that does not retain Tc-99 and I-129.

If you have any questions or would like to further discuss the content of this letter, please contact Jeff Burright, Nuclear Waste Remediation Specialist, jeff.burright@oregon.gov or 503-856-2597.

Sincerely,



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[2] SECY-97-083. Policy Issue: Classification of Hanford Low-Activity Tank Waste Fraction as Incidental. April 14, 1997.

Attachment 1

Oregon Department of Energy Technical Comments on the WIR Evaluation.

1. **<u>Treatment of Technetium-99 and Iodine-129 as "key radionuclides" subject to the first WIR criterion</u>**

As the Oregon Department of Energy has stated in other position letters, we view Technetium-99 (Tc-99) and Iodine-129 (I-129) to be "key radionuclides" that should be removed from low activity wastes to the extent practical.[3] Our highest preference would be for these two constituents to be removed from the LAW waste stream via additional separation.

These constituents were listed as "radionuclides of interest" in the original NRC-DOE discussions of classifying LAW as incidental, but it was determined in 1997 that no technically or economically practical separation process for these constituents existed at that time. However, this determination was made before the Yucca Mountain PA experience had identified Tc-99 and I-129 as key risk drivers.[4] Nearly three decades of technological advances have been realized since that analysis. We note that the 200 West Pump and Treat facility has reportedly been successful at removing both constituents simultaneously from site groundwater using a Purolite ion exchange resin, but we have seen no analysis of the transfer of this technology to the tank waste treatment mission.[5] NRC staff also observed during one of the technical conference calls that the volatilization and offgassing of Tc and I from the DFLAW vitrification system also serves as a *de facto* separation treatment method, opening the potential to dispose of these offgassed constituents into a HLW stream.

It is telling that the WIR evaluation cites an analysis from 1996 to support the assertion that no additional separation technology for I-129 is applicable to Hanford tank waste.[6] This leads us to repeat a question that was asked during the NRC-DOE technical calls: When it comes to removing these two radionuclides, what level of analysis and consideration has been conducted?

Our understanding of the prior agreement between DOE and the State of Washington, memorialized in the Tank Closure and Waste Management EIS, was that a Tc-99 pre-treatment capability was originally included in the WTP design but was later removed with the understanding that LAW would be vitrified and the Tc and I would be retained in the glass. If this waste is instead retained in secondary wastes and encapsulated in grout, then the basis for not including an additional Tc/I separation technology should be revisited.

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[3] https://www.oregon.gov/energy/safety-resiliency/Documents/2020-SRS-EA-Oregon-Comments.pdf

[4] "To the extent that you are trying to make technetium and iodine go into the high level stream and not the low level, you would be acting upon what was learned during the Yucca Mountain economic performance assessment which was: going in we were worried about the wrong radionuclides, and when we got done we found out that iodine and technetium were the risk drivers and that to call them the low activity stream is to misunderstand the processes of waste management that are important." http://www.tvworldwide.com/events/nas/181129/default.cfm?id=17359&type=flv&test=0&live=0 at 26:30 minutes.

[5] Personal communication with Dr. Matt Asmussen, PNNL scientist during an October 2019 meeting between staff from ODOE, DOE and PNNL.

[6] WHC-SD-WM-TI-699, Technical Basis for Classification of Low-Activity Waste Fraction from Hanford Site Tanks

Because the vitrification treatment technology selected for the VLAW is the same as will be employed for the high-level fraction of Hanford tank waste, we realize that some partitioning of the Tc-99 and I-129 into VLAW is inevitable during DFLAW operations. Moving forward, Oregon would like to better understand the potential benefits and challenges associated with further separation and treatment of Tc-99 and I-129 into the HLW stream.

2. <u>Grouted secondary waste should be within the scope of this WIR Evaluation</u>

The VLAW WIR Evaluation explicitly excludes analysis of secondary solid wastes. This "secondary waste" is where a potentially significant portion of the Tc-99 and I-129 will partition depending on the actual rate of volatilization of these constituents and the effectiveness of DOE's planned offgas recycling method.

The DOE procedure TRS-EM-IP-01 R2 "WIR Determinations" states: If a secondary waste stream contains sufficient residual tank waste so as to preclude an *a priori* determination that the waste is not HLW, the waste should either be managed as HLW or analyzed via the Evaluation Process to qualify it as a non-HLW." It is not clear to us how the VLAW secondary waste complies with this procedure.
We understand that DOE's waste management internal policies make use of the secondary waste concept and its corollary, the "new point of generation" concept, as a way to argue that the byproduct of a treatment method becomes a new waste that must be classified and characterized based on its properties at this new point of generation. In practice, we are concerned that this concept may be misused to allow certain waste streams to evade the "High Level Waste" definitional label and its associated requirements. For example, the TSCR ion exchange columns, which are to be heavily loaded with the "key radionuclide" Cs-137, are technically byproducts of a treatment technology. Could these "key radionuclides" be deemed a secondary "non- HLW," even though the WIR process requires their removal from a HLW stream in order to make the remainder no longer HLW?

In its 1997 letter previously cited, the NRC provided provisional concurrence that the LAW would be incidental waste and thus not subject to NRC licensing, but they highlighted a number of specific changes that would necessitate DOE reevaluation and further consultation with NRC. One such change would be if, "The LAW fraction of the Hanford tank waste is not vitrified." It is our position that a reasonable person would consider secondary waste to still be part of the LAW fraction of Hanford's tank waste, and therefore it is within scope of NRC consultation and by extension should be subject to a WIR determination.

3. <u>Ensuring proper treatment and disposal of potential key radionuclides in DFLAW process equipment</u>

During one of the DOE/NRC technical calls, NRC staff asked to what extent Tc-99 and I-129 might be held up in DFLAW system components and equipment rather than be retained in the glass or secondary offgas filtration wastes. This is of concern because DOE has stated that debris from the DFLAW processing system is considered secondary solid waste and would be likely disposed in IDF. It is not clear how much of the Tc-99 and I-129 total inventory could end up in the process equipment, nor what waste form performance may be expected from "processing system debris" disposed in IDF.

We were unable to find an adequate description of the potential inventory of these constituents in process components in the WIR supporting analysis, nor discussion of their disposal impacts. We are interested to see further evaluation of this uncertainty and its potential effects on the disposal system as part of this WIR evaluation. We would like to see this potential inventory explicitly quantified and incorporated in the WIR evaluation, including a discussion of how these radionuclides would be treated and/or immobilized if entrained in the treatment system.

4. **Technetium and Iodine retention in glass as it cools**

We echo a question raised during the DOE/NRC technical calls regarding the Tc-99 retention in the VLAW glass immediately after it has been poured. NRC staff made the observation that Tc-99 seems to volatize efficiently at the glass formulation temperature, so there is an uncertainty whether the Tc-99 will actually stay retained in the glass compared against plating out on the walls or headspace of the canister. We are also interested in the answer to this question.

5. **Managing IDF inventory uncertainty during DFLAW operation**

We note that there seems to be a large assumption underpinning everything in the VLAW WIR - that the glass will retain Tc and I consistent with smaller scale non-operational testing. It is important to have a transparent and thorough process, including oversight by Washington state, to verify that the inventory assumptions in the back end of the LAW vitrification process are consistent with the IDF PA. We would expect this to include a process for secondary waste sampling and waste inventory verification following process upsets that have the potential to affect the inventory split between primary and secondary wastes.

6. **The IDF Performance Assessment should assess compound uncertainties and alternative future states, in accordance with previous Oregon comments and the findings of the NRC Technical Evaluation Report on Waste Management Area C**

As we previously stated in our comments on the WMA-C WIR and Performance Assessment, we believe the uncertainty analysis for the IDF PA has not adequately addressed the potential hazards associated with multiple compounding unfortunate events occurring during the period of performance. We are in the good company of the NRC, which also found issue with the method of uncertainty analysis in its Technical Evaluation Report.[7] We recognize that the PA for the IDF was largely completed by the time the NRC evaluation of WMA-C was published, but DOE should nevertheless endeavor to incorporate the NRC's recommendations regarding uncertainty analysis, as well as Oregon's prior comments on this topic, prior to making a WIR determination for the VLAW.

7. **Retention of technetium and iodine in grout warrants additional technical support**

We note that the NRC's Request for Additional Information on the VLAW WIR includes numerous inquiries regarding the adequacy of the technical support for the performance of grouted secondary wastes. In particular, the NRC requested to see additional support for the effective diffusion coefficients for Tc-99 and I-129 and their performance over very long time periods. We would like to refer you to

[7] https://www.hanford.gov/files.cfm/WMA_C_TER_ML20128J832.pdf

Oregon's own assessment of the state of the science regarding long-term grout performance for these key radionuclides, as part of the recent National Academies of Sciences study on Supplemental LAW Options for the Hanford Reservation, with particular attention to the potential confounding geochemical interactions in the disposal environment and the long-term performance of silver as an iodine getter.[8] We would like to see these technical issues addressed prior to the disposal of a grouted waste form containing these constituents, in so far as the Performance Assessment relies on improved grout performance in order to demonstrate disposal performance objectives.

8. <u>Oregon's prior comments on the WMA-C WIR related to cumulative effects and public involvement in adaptive management remain relevant to the present WIR determination</u>

In our 2018 letter on DOE's WIR Evaluation for Waste Management Area C, we offered suggestions and requests for how the process might be improved to better and more inclusively manage risk. As we still await a response to that letter, we repeat here that we would like to see DOE present the whole "decision package" related to a WIR waste before a final determination is made. This includes the Composite Analysis, required by DOE Order 435.1 prior to disposal authorization in a new low level waste disposal facility, and the performance assessment maintenance plan. We also suggested that including the public in the Performance Assessment Maintenance Plan represents an opportunity to collaboratively manage uncertainty and instill lasting confidence that DOE is committed to good long-term risk governance.

[8] https://www.oregon.gov/energy/safety-resiliency/Documents/NAS-Supplemental-LAW-study-Aug-2019.pdf