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General Comment

Please see the attached letter containing comments by the State of Oregon on the Draft Regulatory Basis for Disposal of Greater Than Class C and Transuranic Waste.

Attachments

Oregon NRC GTCC comments 111419

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November 14, 2019

Annette Vietti-Cook, Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001,
ATTN: Rulemakings and Adjudications Staff

Docket ID No.: NRC–2017–0081

Subject: Comments on the Draft Regulatory Basis for Greater Than Class C Waste Disposal

Dear Ms. Vietti-Cook,

The State of Oregon appreciates this opportunity to provide comments on the Draft Regulatory Basis for Greater Than Class C (GTCC) Disposal in near-surface environments. Oregon does not currently generate GTCC waste nor host a low-level radioactive waste facility under consideration for GTCC disposal; however, our proximity to the Hanford Site and long-term interest in the safety and value of the Columbia River has led to our active participation in the national conversation on nuclear waste disposal. We would like to see potential impacts to the Pacific Northwest considered as the regulatory path for GTCC waste continues to develop.

Near-surface disposal facilities have historically been recognized in 10 CFR Part 61 as an unsuitable environment for GTCC wastes due to the intensity of radioactivity and the longevity of the hazard (predominantly to potential future intruders). Despite this general tenet, existing law does allow a case-by-case evaluation of proposals for a disposal facility to accept GTCC wastes, subject to NRC approval.

With this new regulatory basis, the NRC is trying to establish technical credibility for the near-surface disposal of the nation's known GTCC inventory in a semi-arid environment "as a matter of course," (NRC 2019, p. vii) so long as additional precautions are employed. Meanwhile, statements from NRC staff during public meetings suggest that a site-specific case-by-case approval of near-surface disposal would still be necessary, but this authority may be granted to Agreement States. To support this regulatory framework, the Draft Regulatory Basis concludes that the hazards associated with near-surface GTCC disposal are not at the level that continued Federal oversight is necessary.

In our review, we have found that the technical work in the Draft Regulatory Basis appears to be sound, but we question some of the policy decisions regarding the scope of the analysis and the standards to which a future disposal facility might be held under the evaluated scenario. These issues are discussed below.

Finally, we note that this regulatory effort to validate a sub-optimal disposal environment would not be necessary if the nation had an available alternative that could provide the greater protection from direct radiation exposure represented by deep disposal. In essence, the Draft Regulatory Basis proposes to exchange the relative security of prescriptive physical protection for the mathematically derived protection of a model's prediction of how an integrated near-surface natural, engineered, and human social system will behave. If this reliance on models is adopted, we wish to highlight some of the assumptions in the present modeling that may be critical to future health risk from the disposal of these wastes.

The GTCC Regulatory Basis Should Be Cognizant of New Potential GTCC Waste Streams

We must make note of what is not included in the Draft Regulatory Basis. With the U.S. Department of Energy's (DOE) revised interpretation of the definition of High-Level Radioactive Waste (HLW) (84 FR 26835), we believe it is reasonably foreseeable that a significant portion of wastes currently managed as HLW could be pursued for disposal as GTCC, transuranic, or both. Such wastes may include but not be limited to the following:

- Highly radioactive cesium and strontium capsules at Hanford. The 1,335 cesium capsules are forecast to exceed Class C concentrations for another 372 years, after which time they will continue to be Class C for a few millions of years because of the presence of Cs-135. The 601 strontium capsules would not reach Class A concentrations for approximately 800 years.[1]
- 34 canisters of "German logs" at Hanford, which are vitrified tank wastes currently stored on site.
- The "high-level" waste glass slated to be produced at the Hanford Waste Treatment Plant, assuming a performance model suggests the waste could qualify for near-surface disposal as GTCC.
- Ion exchange columns from the Tank Side Cesium Removal process at Hanford and the Tank Closure Cesium Removal process at the Savannah River Site. These columns are expected to contain as much as 60,000 Curies of Cesium per column, plus potentially an unknown quantity of soluble strontium-90 and technetium-99.[2]

These additional potential GTCC wastes have different characteristics than the 17 streams identified in the Draft Regulatory Basis and the GTCC Environmental Impact Statement[3] (EIS) on which the basis relies. Therefore, if the Regulatory Basis is intended to cover all GTCC and GTCC-like waste, it would appear to be incomplete. We acknowledge that the NRC does not directly regulate the wastes listed above, but our concern is that in much the same way the NRC is building on DOE's analysis in the GTCC EIS, DOE or a commercial facility may at some future date build on the NRC's regulatory basis to justify near-surface disposal of these wastes. Therefore, we view it as important that the NRC's present Regulatory Basis consider the

[1] National Research Council. 1996. *The Hanford Tanks: Environmental Impacts and Policy Choices*. Washington, DC: The National Academies Press. https://doi.org/10.17226/5403.
[2] Curie estimate obtained from DOE, 2019. "U.S. Department of Energy, Office of River Protection Submittal to the Washington State Department of Health TOC-ENV-NOC-5293, Rev. 0, Radioactive Air Emissions Notice of Construction Application for the Storage of Spent Ion Exchange Columns." 19-ECD-0074.
[3] DOE, 2016. Final Environmental Impact Statement for the Disposal of Greater Than Class C Waste and GTCC-Like Waste. DOE/EIS-0375.

applicability of its technical analysis to the disposal of these new potential additional GTCC waste sources, or else specifically state that the Regulatory Basis does not apply to such wastes.

NRC staff emphasized in the two public meetings focused on the GTCC Regulatory Basis that ultimately a decision on GTCC disposal must be site-specific. That includes a site-specific model incorporating data regarding the exact wastes being disposed. In other words, every decision is unique, and a blanket Regulatory Basis will not necessarily provide the basis for a disposal decision. Despite these assurances, we disagree with the NRC's summary statement that approximately 80 percent of the GTCC waste will be potentially suitable for near-surface disposal. Because of the potential missing "GTCC-like" wastes we have identified, the actual percentage of waste compatible with near-surface disposal is unknown. In fact, even the 17 known waste streams have an unknown compatibility with deep disposal until that waste is characterized and prepared for disposal.

Reduce the 500 Millirem per Year Dose Standard, or Formally Standardize the Role of Probability in Determining Compliance with Dose Standards

We recognize that the Regulatory Basis assumes a 500 millirem per year (mrem/yr) dose standard (both chronic and acute) for a future intruder. This is higher than the 100 mrem/yr chronic dose standard for DOE LLW facilities per Order 435.1 and higher than the 25 mrem/yr standard that the NRC requires for decommissioning and unrestricted use of land in 10 CFR 20. It is also higher than the 40 CFR 191 standard for high-level or transuranic waste disposed in a deep geologic repository (excluding Yucca Mountain), which requires no greater than 15 mrem/yr annual committed effective dose received through all potential pathways from the disposal system to any member of the public.[4] 40 CFR 191 does provide for alternative standards if substituted in rule by the EPA Administrator.

The basis for the 500 mrem/yr dose standard appears to derive from the deliberations that led to the Environmental Impact Statement for 10 CFR 61 in 1981 (NUREG 0782). In the EIS, it is documented that the participants in a workshop at the time chose 500 mrem/yr – out of three possibilities ranging from 25 mrem to 5,000 mrem – based on a combination of cost feasibility and the relative protectiveness achieved (p. 4-65). This is akin to a "just right" Goldilocks exercise in policy-making, which occurred before the performance standards for a deep repository had been codified in 40 CFR 191.

The 500 mrem/yr standard proposed in the GTCC Draft Regulatory Basis contains another dimension that is not readily apparent. In discussions with NRC staff during this comment period, it was reasoned to us that the 500 mrem/yr is functionally equivalent to a 25 mrem/yr standard if one assumes that there is a 5% probability of the event occurring that a future intruder is exposed to the waste. In other words, the NRC appears to be incorporating likelihood into its standard in a novel way. This implies that the NRC is assuming permanent institutional control of a disposal facility and assuming that it is acceptable to utilize probability when assigning the 500 mrem/yr standard. It also makes assumptions about the waste emplacement configuration and driller barrier robustness, discussed below.

We question whether it is proper for a strict dose-based standard to be partially based on probabilities. This is a policy decision that is embedded in the technical analysis within the

[4] 40 CFR 191.15(a)

Regulatory Basis. The current standards for radioactive waste disposal – including those for deep geologic disposal – do not allow an inflation to a higher dose limit as a proxy for the low probability of intrusion, as the new GTCC technical basis appears to do.

If the NRC is going to revise its low-level waste disposal rules in the present day, all attempts should be made to ensure consistent protection of a future intruder no matter the classification of the waste. We fail to see an adequate justification in the Regulatory Basis for why a 500 mrem/yr chronic dose standard is appropriate for GTCC disposal. If the NRC is relying on probability of intrusion to reduce the "real" risk to a future person, this policy decision should be formally acknowledged, justified, and opened for public comment in the development of the dose standards in 10 CFR Part 61 and the GTCC regulatory framework moving forward. The regulatory basis for the 500 mrem/yr standard should also explicitly discuss the known or expected effects to human health and the environment that would result from this dose standard, as well as ensure consistency between disposal facility standards and the requirements of risk-based environmental laws such as CERCLA and RCRA.

The Feasibility of "Robust" Driller Barriers for 500 Years Must be Held to a High Standard of Evidence

Figure B-2 in the Draft Regulatory Basis shows that approximately seven of the 17 evaluated waste streams can only meet the 500 mrem/yr standard in a near-surface disposal facility if an intruder can be completely prevented from drilling into the waste for 500 years. This approximation does not account for potential cumulative effects from co-located waste streams.

A key dependency in the Draft Regulatory Basis is a credible belief that an intruder barrier can be built to withstand modern drilling equipment (to say nothing of future drilling technology), and that such a barrier would be able to maintain this property for 500 years. When we asked about this during the August 22 public webinar, we were told that the NRC does not specify the construction methods or materials of intruder barriers. It only establishes the performance requirements of such a barrier that an applicant must meet.

It is logical to assume that an applicant for a GTCC disposal facility will strive to make the most cost-effective cap possible. The barrier design therefore may not include sufficient engineered detractors, appropriate ingenuity to anticipate the psychology of future drillers, or adequate rigor regarding the capabilities of different drilling technologies versus the materials proposed to be used. We view this as the highest risk potential source of regulatory failure. We also note the simple fact that drillers regularly puncture all kinds of subsurface materials today, including reinforced concrete and competent crystalline bedrock.

The Regulatory Basis should include technical support for the assertion that a future driller within the next 500 years will not be able to penetrate a barrier that an applicant proposes to install within their disposal facility. While the NRC may not be in the business of designing barriers directly, it is reasonable (and more efficient from a regulatory standpoint) to ensure that a barrier requirement is remotely achievable before it is included as a prerequisite to the type of disposal context analyzed in the Draft Regulatory Basis. Otherwise, the NRC is essentially proposing to promulgate a dose standard for GTCC without first ensuring that it can be feasibly met.

As the Regulatory Basis discussion continues to evolve, the NRC should incorporate whatever technical basis is available in the international waste management community to provide reasonable assurance that a sufficiently robust driller barrier is technically and economically feasible.

As an additional concern, the calculation in Figure B-2 assumes that the waste is emplaced in a single 0.5 meter thick layer, which is an unlikely configuration. Even if disposed in a single layer, we note that a standard 55 gallon drum is 0.88 meters tall. The thickness of the waste layer is a highly significant variable to the driller dose, both because it determines the total volume of waste exhumed but also the ratio between exhumed waste and unaffected soil in the drilling column. The resultant dose to a future driller in a stacked configuration would be higher if they were to succeed in drilling through the barrier. NRC staff have been clear that the analysis in the Draft Regulatory Basis is no substitute for a site-specific model. However, a more realistic stacked disposal configuration would be a more conservative and realistic scenario considering the impracticality of the spatial requirements to dispose of all GTCC waste in a single layer, the associated scale of a "robust" driller barrier, and the resultant facility cost.

NRC Technical Concurrence Should Be Required if States are Delegated Authority to License GTCC Disposal

As a related concern to the above, we question the capabilities of a state level regulating agency to endorse the effectiveness of a 500-year driller intruder barrier given our current reservations about the feasibility of such a barrier. We know well that state government radiation protection divisions around this nation provide admirable levels of service with limited resources. However, these agencies are not as uniformly practiced as the Nuclear Regulatory Commission in regularly using specialized technical capabilities associated with system modeling, technology development research, and/or uncertainty analysis. Therefore, the outcome of this Regulatory Basis exercise should not be to give total discretion to Agreement States for the licensing of GTCC disposal. There must be an appropriate and timely review process by the NRC and any other interested parties to ensure that the solution as proposed can meet the objectives of the regulation. Such an analysis requires sufficient site data (e.g., hydrogeology, climate, geochemistry) and waste inventory certainty to develop a technically defensible model representing "best available science."

We observed that even in the NRC's own technical support document for the GTCC Regulatory Basis[5], there was a significant difference between intruder modeling conducted by a contractor versus NRC staff. A single reduction factor in one of the models was implicated for the significant variation in dose to a future onsite receptor. The discovery of this factor was a result of in-depth analysis by NRC staff. This difference between the NRC staff and contractor modeling results for the intruder illustrates the need for high technical rigor in the model development for this unique site-specific analysis. Consequently, we perceive a risk in allowing an Agreement State to have authority over the adequacy of such complex models without direct NRC technical oversight given their greater resources and experience in this highly specialized arena.

[5] Esh, et al., 2019. TECHNICAL ANALYSIS OF THE HAZARDS OF DISPOSAL OF GREATER-THAN-CLASS C (GTCC) AND TRANSURANIC WASTE. Accession Number: ML19162A259.

In proposing this rule, the NRC is accompanying DOE on a redefinition of the rules around a concept of "risk." As we stated to the DOE, we do not necessarily oppose risk-based solutions to our nation's nuclear waste problem, but it is critically important to maintain public trust. In simple terms, it seems unwise to let government entities make risk-laden decisions alone. We contend that it is the NRC's responsibility to ensure that there is a rigorous scientific ethos underlying any decision to leave a long-term hazard in a near-surface environment.

Sincerely,

Ken Niles
Assistant Director for Nuclear Safety

Cc: National Governors' Association Federal Facilities Task Force