

Draft CTF comments on NRC's draft report entitled *Standard Review Plan for Activities Related to U.S. Department of Energy Waste Determinations*, NUREG-1854, May 2006.

June 24, 2006

This NRC draft report provides guidance to NRC staff for conducting activities related to waste determinations, particularly "waste incidental to reprocessing" ("WIR") determinations by which certain wastes from the reprocessing of spent nuclear fuel "can be considered low-level waste and managed accordingly." (p. iii) As stated by NRC, the draft report applies to four sites, including the West Valley [NY] and Hanford [WA] sites. We disagree. The guidance given in the NRC draft report cannot be applied legally to make WIR determinations for waste at the West Valley site; existing law does not allow it.

Despite this concern that the WIR determination guidance cannot legally be applied at all at West Valley, we will provide both general comments and detailed comments on the draft NRC report.

1. The draft report (p. xiii) cites the National Defense Authorization Act for Fiscal Year 2005 (NDAA) as the legal authority for conducting WIR determinations in South Carolina. Such legal authority does not exist, however, in other states such as Washington and New York where the Hanford and West Valley sites are located.

2. The draft report (pp. xvii-xviii, xix, xx, 1-9, and 2-3) cites NRC's prior announcement, made in 2002 in its *Final Policy Statement for the Decommissioning Criteria for the West Valley Demonstration Project*, that WIR determinations can be applied to waste management activities at the West Valley site, including the West Valley Demonstration Project. However, it appears that any use of WIR determinations to reclassify waste at the West Valley site would violate at least one law (the Nuclear Waste Policy Act). If applied to DOE activities at the West Valley Demonstration Project, WIR determinations would also violate a second law, the West Valley Demonstration Project Act. In both of these laws, Congress created waste classification systems that define high-level waste in a way that cannot be overruled by an executive agency such as NRC. NRC is mistaken in thinking that it can authorize or participate in WIR determinations that are inconsistent with the waste classifications defined by Congress.

3. The draft report (p. xix) suggests that DOE Order 435.1 may authorize WIR determinations on waste sent offsite from the West Valley site. This suggestion is defective for the same general reason given above: Congress created waste classification systems that define high-level waste in a way that cannot be overruled by an executive agency such as DOE. NRC is mistaken in thinking that DOE can authorize or participate in WIR determinations that are inconsistent with the waste classifications defined by Congress.

4. The draft report describes the use of the performance objectives of NRC's 10 CFR Part 61 regulations, Subpart C, as important criteria in any WIR determination. However, it should be

noted that the 10 CFR 61 regulations were intended to be protective *when used in their entirety*. The same degree of protectiveness cannot be achieved when portions of the 10 CFR Part 61 regulations are used selectively, without complying with the full set of requirements. As stated in the draft report, p. xv, WIR determinations “typically use the performance objectives of 10 CFR Part 61, Subpart C, as a criterion that must be met (see Section 2); references to other parts of the regulations in 10 CFR Part 61 (i.e., other than Subpart C) are included only to provide information and guidance as they relate to the staff reviews.” Such selective use of 10 CFR Part 61 does not provide adequate protection.

5. If we assume for the sake of argument that a WIR determination is a legal way to reclassify waste, we find that the draft report contains various points of good guidance on how to conduct WIR determinations. Some of these are listed below, along with other points that are problematic.

6. In Chapter 1, a good level of detail is required for detailed technical reviews, as outlined on pages 1-1 through 1-9. Required information includes, for example, summaries of performance assessments, intruder analyses, exposure pathways, and dominant radionuclides (p. 1-2); descriptions of relevant physical and chemical forms of radionuclides, design features in relation to performance objectives, design criteria in relation to natural events and processes, information on past waste management practices, and information on previous waste releases (p. 1-3); information on the human population distribution and also on local biological characteristics such as plants or burrowing animals that could compromise waste containment (p. 1-4); assessments of land use, ground and surface waters, and natural resources (p. 1-5); descriptions of surface and subsurface geology, including geomorphology, erosion processes, structural geology and the potential for seismic events, slope stability, etc. (p. 1-6); descriptions of hydrologic features, zones, and parameters (pp. 1-6 to 1-7); information on radiological status of the site, including past releases and plume movement (pp. 1-7 to 1-8); and evaluation of prior waste determinations, including source terms and inventories, performance assessments and dose modeling calculations, etc. (p. 1-9).

7. In Chapter 1, section 1.1.3.3 on meteorology and climatology needs to require consideration of future effects from carbon emissions. Both this section (p. 1-5) and the review procedures on p. 4-19 need to require assessment of the ongoing climate change that is caused or aggravated by human activities, especially the increased frequency or severity of extreme weather events that are a recognized consequence of rising concentrations of greenhouse gases in the atmosphere. Erosion at the West Valley site is particularly sensitive to extreme precipitation events. Such events are not only linked to the cyclical processes and orbital patterns mentioned on p. 4-19; they are also aggravated by human effects on climate. The draft report needs to ensure that these human climatic effects are taken into consideration, especially since these effects can be expected to continue (and become more severe) for decades into the future as atmospheric carbon dioxide concentrations continue to rise. Note that an increased frequency and severity of extreme weather events means not only more high-precipitation events but also more prolonged droughts. The combination of these two effects produces a concern that is illustrated on p. 4-19, where NRC refers to the importance of “short duration, large magnitude events, especially when

discrete high-permeability pathways that can transmit large amounts of infiltration are present in the near-surface (e.g., desiccation cracks in a clay soil).” This concern applies directly to the West Valley site where such infiltration aggravates slumping and accelerates erosion. The link to human-induced climate changes must be made.

8. In Chapter 2, in relation to the possible substitution of “comparable” safety requirements for the performance objectives of 10 CFR Part 61, Subpart C, NRC makes a good point that “strong justification for using alternative safety requirements would be required, unless it can be determined that the proposed alternative safety requirements are more stringent than those of 10 CFR Part 61, Subpart C.” (p. 2-6)

9. In Chapter 2, page 2-7, NRC states that its staff uses 25 mrem total effective dose equivalent (TEDE) in place of the dose limits specified in 10 CFR 61.41. This NRC practice cannot be assumed in all cases to be as protective as 10 CFR 61.41 (depending, for example, on the concentration of radioactive iodine in a given quantity of waste). NRC would need to show on a case-by-case basis that its proposed alternative safety requirement (25 mrem TEDE) is as protective as the legally binding requirement in 10 CFR Part 61, Subpart C.

10. In Chapter 2, page 2-8, NRC correctly emphasizes the importance of site stability, as required by 10 CFR 61.44. In particular, NRC makes a good point that the effects of site instabilities identified in its review must be adequately modeled or bounded by performance assessments and intruder analyses. Site instability effects would include, for example, erosion effects at the West Valley site.

11. In Chapter 3, p. 3-1, NRC states that, “Analyses to support NRC license modification or termination at West Valley will be performed independently of the waste determination process...” This statement may create a potential concern for NYSERDA at the West Valley site, in the event that NRC might decide not to apply the same criteria to DOE’s waste determination activities as to NYSERDA’s license termination activities.

12. In Chapter 3, pages 3-5 to 3-10, NRC focuses on “highly radioactive” radionuclides and states that these radionuclides “are defined in terms of the risks they pose to various receptors...” NRC should ensure that long-lived mobile isotopes such as Tc-99 and I-129 are included in this category of “highly radioactive” radionuclides, or, if not, that adequate protection from long-lived mobile isotopes is achieved in some other way.

13. In Chapter 3, p. 3-6, NRC makes a good point that “it is particularly important that the reviewer evaluate the potential uncertainties in predicted receptor doses” and recommends that, in identifying uncertainties, “the reviewer should consider the results of independent performance assessment and inadvertent intruder analyses.” Additional good points include the review procedures specified in section 3.2.2, pages 3-6 to 3-7. The meaning of “independent” in the above sentence is illustrated on p. 4-10, where NRC suggests that it may be necessary in certain circumstances for the reviewer “to perform independent analysis of the disposal system.”

14. In Chapter 3, p. 3-8, NRC makes a good point that information about available technologies for radionuclide removal may be found in reports from other DOE sites as well as reports from third parties such as National Academy of Sciences or Defense Nuclear Facilities Safety Board. NRC cites specific examples of such reports on p. 3-10.

15. In Chapter 3, pages 3-9 to 3-13, NRC properly emphasizes the need to ensure that radionuclide removal is not stopped prematurely. On page 3-16, NRC makes a good point that additional protective measures for reducing worker risk would need to be evaluated, in the event that radiological risks to workers are cited by DOE as a reason why additional radionuclide removal is impractical.

16. In Chapter 3, pages 3-17 to 3-23, NRC discusses concentration averaging, wherein residual radioactive waste is mixing with nonradioactive material for the purpose of waste stabilization. NRC describes concentration averaging practices that it considers appropriate and other such practices that it considers inappropriate. On page 3-18, NRC lists several principles that are intended “to prevent arbitrary or incorrect classification of materials that may result in near-surface disposal of materials that are not suitable for near-surface disposal.” On page 3-19, NRC indicates that “mixing with excessive amounts of stabilizing materials solely to reduce the waste concentrations to alter waste classification should not be performed. In most cases, the ratio of the unstabilized to stabilized radionuclide concentrations would not be significantly greater than a factor of 10 for waste classification purposes.” We are concerned that such tenfold dilution is too large a dilution factor to be protective (a lower factor would be better) but otherwise recognize that these NRC statements establish limits on the practice of concentration averaging.

17. In Chapter 3, pages 3-20 to 3-21, we are concerned about an example provided by NRC that is roughly analogous to the type of concentration averaging that DOE might try to apply to HLW tank 8D-2 at the West Valley site. In this example, NRC would allow a twentyfold dilution (waste concentrations “would be reduced by a factor of 20 for estimating waste classification”), assuming a 0.1-cm-thick layer of residual waste that is not easily removed from a 1-cm-thick tank wall and is then covered by a 1-cm-thick layer of stabilizing grout. NRC would allow the 2-cm combined thickness of the tank wall and grout to serve as “dilution” for the 0.1-cm residual waste layer (hence the dilution factor of 20), even though the residual waste layer would not be physically mixed with either the tank wall or the grout. This is unprotective for two reasons. First, a dilution factor as large as 10 or 20 should not be allowed in general; it is not sufficiently protective for near-surface disposal. Second, neither the tank wall nor the grout would serve any real purpose of stabilization in this West-Valley-type example. After the steel tank wall rusts through, it will no longer exist as a barrier to radionuclide migration. It will be replaced by particles of rust (primarily iron oxides) through which water can migrate. The grout, located on the other side of the residual waste layer, will be essentially irrelevant when radionuclides start to migrate and leach toward the bed of rust. Since the grout is *not* assumed to be physically mixed with the residual waste, it cannot stabilize radionuclides that are migrating *away from* the grout.

18. In Chapter 3, p. 3-21, in the context of 10 CFR 61.58, NRC makes a good point that, “When performing the intruder calculations, it is not appropriate to calculate an average dose factoring

in the likelihood of the occurrence of the scenario. The likelihood of the intruder scenario occurring is already represented in the higher limit (e.g., 500 mrem/yr) applied for inadvertent intruder regulatory analysis.”

19. In Chapter 3, in section 3.5.1.2 on pages 3-22 to 3-23, we are concerned that NRC may allow near-surface disposal of “wastes that do not meet the Class C concentration requirements” through a consultation process with DOE. NRC needs to recognize that some proposed WIR determinations may produce unacceptable options for waste disposal, in which case NRC would need to deny the WIR determination in accordance with its own rules. Consultation cannot be viewed as a universal last resort that would justify unacceptable WIR determinations.

20. In Chapter 4, pages 4-1 to 4-49, NRC reviews performance assessments and their many components, with emphasis on proper methods, assumptions, and review procedures.

21. In Chapter 4, p. 4-4, NRC makes good points about institutional controls and the need to limit reliance on such controls. In general, the concern is that human societies may be unwilling or unable to maintain institutional controls for the thousands of years during which certain radionuclides remain hazardous. The underlying regulatory philosophy, as noted by NRC, is based on “the relatively large uncertainty associated with predicting societal systems.”

21. In Chapter 4, p. 4-10, NRC makes good points about data uncertainty and indicates that appropriate review procedures should be used “to ensure that DOE has captured the variability in data and provided an assessment of uncertainty due to the incomplete knowledge of the natural system, engineered system, or [waste] inventory.” NRC endorses either probabilistic or deterministic analysis but would require that deterministic analysis be supported by the use of sensitivity analyses and be bounded by the selection of conservative values. Conceptually, we recognize that either type of approach (probabilistic or deterministic) is reasonable, yet we remain concerned that deterministic analyses can be abused or biased by exaggerated claims of “conservative” values. A primary benefit of probabilistic analysis is that the range of uncertainty for each value is clearly stated and is then carried through the performance assessment in an explicit and formal manner. A deterministic analysis does not carry the uncertainty through the performance assessment, but, instead, uses some degree of “worst-case” or “conservative” values as its starting-point. This is susceptible to abuse, especially when values are claimed to be “conservative” but are far from worst-case values, or when agencies justify the use of certain unconservative values by claiming that other values in the same calculation are overly conservative. In such cases, given the complexity of the calculations, the final degree of conservatism in a deterministic analysis is hard to decipher. For these reasons, NRC must either require probabilistic analysis or ensure full compliance (not just lip service) with its safeguards for deterministic analysis, consisting of appropriate sensitivity analyses and adequately conservative values.

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