Department of Energy
Washington, DC 20585

November 16, 2017

Ms. Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Ms. Vietti-Cook:

This letter responds to the Nuclear Regulatory Commission's (NRC's) request published in the *Federal Register* on October 17, 2017, for comment on its August 2016 *Draft Regulatory Analysis for Final Rule: Low-Level Radioactive Waste Disposal (10 CFR Part 61)* (NRC-2011-0012/RIN 3150-A192). NRC's October request seeks cost and benefit information to better inform an NRC updated draft regulatory analysis to accompany the supplemental proposed rule, anticipated in 2018. The attached comments, on behalf of the U.S. Department of Energy (DOE), are organized to answer the seven questions identified in the *Federal Register* request of October 17, 2017.

DOE appreciates the consideration given by NRC to previous public input, including from DOE, regarding the proposed draft final rule to amend Title 10 Code of Federal Regulations (CFR) Part 61, *Licensing Requirements for Land Disposal of Radioactive Waste*. We welcome and agree with the Commission's recent Staff Requirements Memorandum that addressed DOE's concerns regarding grandfathering, time of compliance, safety case, defense-in-depth, and costs. We particularly welcome the Commission's direction to reinstate the single 1,000-year compliance period for low-level radioactive waste disposal. DOE looks forward to reviewing and commenting on the supplemental proposed rule and revised regulatory analysis during the upcoming comment period.

Taxpayers and the nuclear fuel cycle industry have a large stake in the cost impacts from the supplemental proposed rule since it could directly impact regulatory and operations costs at commercial disposal facilities—particularly, but not exclusively (depending on the final rule), at facilities that have in the past, or will likely in the future, dispose of depleted uranium (DU). DOE manages a large DU inventory that may be disposed of in commercial disposal facilities licensed by NRC Agreement States or in DOE disposal facilities.

We continue to have concerns with respect to regulatory precedent and cost impact regarding the proposed inclusion of radon dose in the all pathways performance objective. Such a requirement would necessitate actions to limit radon exposures—hypothetical exposures in the future—to meet dose levels that are more than an order of magnitude lower than currently accepted residential guidelines.

It is also important to recognize that the impacts of this rulemaking are not limited to disposal at commercial disposal facilities. DOE is directly impacted by the 10 CFR Part 61 rulemaking. For example, NRC staff have applied draft interim guidance (NUREG-1854)[1] that reflects the approach in the earlier, proposed draft final rule for 10 CFR Part 61, including the 10,000-year compliance period, in their consulting and monitoring roles for DOE tank closure and disposal actions conducted under Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA). DOE requests that the NRC staff immediately stop applying the 10,000-year compliance period in their consulting activities being conducted under Section 3116 of the NDAA. In addition to the supplemental proposed rule, we look forward to a risk-informed and cost effective revision of the accompanying regulatory guidance (as well as NUREG-1854) consistent with the Commission's direction in the Staff Requirements Memorandum.

If you have any questions on these comments, please contact me at (202) 586-0785 or Mr. Douglas Tonkay, Director of Waste Disposal, at (301) 903-7212.

Sincerely,

Mark Senderling
Deputy Assistant Secretary for
Waste and Materials Management

Enclosure

[1] NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations, NUREG-1854, Draft Final Report for Interim Use (August 2007).

U.S Department of Energy
10 CFR Part 61, Draft Regulatory Analysis Questions and Comments

Question 1: Is the Nuclear Regulatory Commission (NRC) considering appropriate alternatives for the regulatory action described in the draft regulatory analysis?

As directed by the Commission, the NRC regulatory analysis must be updated to consider a 1,000-year compliance period and not a 10,000-year compliance period as analyzed in the draft regulatory analysis. It should also provide additional information to fully explain what is meant by a compliance period.[1] The 1,000-year compliance period directed by the Commission is appropriate and will be protective of human health and the environment. The application of a 1,000-year compliance period carries the same qualitative benefits as described in the draft regulatory analysis for a 10,000-year timeframe; it ensures that low-level radioactive waste streams can be disposed safely and facilitates the use of site-specific information and waste acceptance criteria.

Similarly, according to Commission direction, the analysis should include evaluation of alternatives that allow grandfathering for commercial facilities that do not plan to dispose of large quantities of depleted uranium (DU), so as to avoid unnecessary costs at those facilities that are operating in compliance with existing rules.

Question 2: Are there additional factors that the NRC should consider in the regulatory action? What are these factors?

The analysis needs to specifically consider other related impacts, such as:

- Impacts on DOE tank closure and disposal actions from NRC activities under Section 3116 of the National Defense Authorization Act for Fiscal Year 2005 (NDAA),
- Ongoing storage costs for DU waste accumulating while waiting for disposal paths to be available (DOE is paying for storage of DU at a commercial facility where planned disposal was halted pending this regulatory action),
- Effort required to demonstrate stability for the compliance period (benefit of keeping a 1,000- year time of compliance) and, if included in upcoming supplemental rule, preparation of a defense-in-depth analysis, which is not currently required,
- Potential need for increased cover thickness to meet a radon-inclusive dose standard,
- Increased efforts to build and maintain the performance assessment (PA) model supporting site-specific activities (benefit of keeping a 1,000-year time of compliance), in addition to the cost of the technical analysis, and
- Added effort to meet the requirement to conduct an additional technical analysis at closure.

[1] DOE uses a 1,000-year time of compliance, but routinely extends calculations beyond 1,000 years to identify peaks in the far future in order to fully consider the potential impacts. In such instances DOE's approach to interpretation of doses after 1,000 years is consistent with risk-informed decision-making and is technically justified given the increasingly speculative nature of calculations over long time periods.

Some examples are discussed in response to the questions below (see questions 4 and 7, in particular). In addition to the rule itself, the accompanying regulatory guidance must also be risk-informed and cost effective.

Question 3: Is there additional information concerning regulatory impacts that the NRC should include in its regulatory analysis for this regulatory action?
DOE recognizes the importance of promulgating risk-informed regulations. We agree on the importance of site-specific PAs to consider the impacts at disposal sites. We also appreciate that cost considerations must not take precedence over safety. However, consistent with NRC's direction, care should be taken to understand the cost implications and relative benefits of regulations, including how guidance affects implementation of such regulations. Analysis should be sensitive to excessive cost or current worker dose impacts to address potential radiation doses that are considered to be "relatively low" and would not occur, if at all, until thousands of years in the future. Likewise, it is unjustified to limit "potential" radon doses in the future to levels more than 20 times below actual exposures not considered to require remediation today.

NRC should highlight in the revised regulatory analysis that requirements in the upcoming supplemental rule would be consistent with other existing promulgated rules. For example, the 1,000-year time of compliance is consistent with analyses conducted for disposal actions under 10 CFR Part 20.2002, and analyses for 10 CFR Part 40, which also addresses disposal of uranium and uranium-contaminated waste. The 1000-year time of compliance is also consistent with DOE's *Radioactive Waste Management Manual* (DOE Manual 435.1-1).

The revised regulatory analysis should consider impacts of inclusion of radon and daughter products in the all pathways dose performance objective, if retained in the supplemental rule. For example, potential impacts include additional modeling and disposal cell design and construction, including the cap. As proposed in the draft final rule, the inclusion of radon in the all pathways dose performance objective is problematic as it would be inconsistent with other existing promulgated rules; for example, 10 CFR Part 40, Appendix A, Criterion 6; 40 CFR Part 61, Subpart H; 40 CFR Part 190.10(a); 10 CFR Part 20.1101(d) (as well as DOE Manual 435.1-1). These existing promulgated rules (and the DOE manual) all specifically exclude radon and daughter products from the dose criterion; radon and daughters are addressed with a separate flux or concentration standard.

The revised regulatory analysis should also consider the potential costs of the use of a specific performance objective for inadvertent human intrusion. As the draft final rule was written, it included a dose limit in the performance objective for inadvertent intrusion; the revised regulatory analysis should explain that this approach, if retained, may require additional measures to mitigate impacts of inadvertent intrusion based on an assumption that intrusion and subsequent exposures will occur with a probability of 1.00. International recommendations have emphasized considering potential doses resulting from inadvertent human intrusion in the context of optimization and existing exposures, rather than using a constraint or compliance limit. Analyses for disposal under DOE Manual 435.1-1 also treat doses from inadvertent human intrusion as a performance measure rather than a specific performance objective.

Question 4: Are all costs and benefits properly addressed to determine the economic impact of the rulemaking alternatives? What cost differences would be expected from moving from the discussed 1,000 year and 10,000 year compliance periods to a single 1,000 year compliance period? Are there any unintended consequences of making this revision?

DOE is fully supportive of moving to a single 1,000-year time of compliance and sees no unintended consequences. DOE expects significant cost benefits from implementing the Commission's direction. In contrast, we believe there would be significant unintended consequences of retaining a 10,000-year compliance period: added effort and cost without meaningful benefits in terms of safety and protectiveness of disposal.

Experience with the NRC staff review of the technical analysis using draft interim guidance (NUREG-1854) for the Saltstone Disposal Facility (SDF) at the Savannah River Site (SRS) highlight real cost impacts of the application of a 10,000-year compliance period. In performing their monitoring role in coordination with South Carolina under Section 3116 of the NDAA, NRC staff issued a Type IV "Letter of Concern" to DOE in April 2012 stating that "the NRC does not have reasonable assurance that salt waste disposal at the SDF meets the performance objectives..." even though "... the potential dose to an off-site member of the public from DOE's disposal actions is still expected to be relatively low." The NRC expressed concern that a potential peak dose of approximately 90 millirem/year was calculated for a sensitivity case approximately 13,000 years in the future. Because of uncertainties in timing of peak dose, NRC staff could not conclude there was reasonable assurance that the peak dose would not exceed 25 millirem/year within 10,000 years (e.g., a potential peak of ~80 millirem/year at ~8,000 years was verbally discussed). Notably, this dose is less than the 100 millirem/year limit found in 10 CFR Part 20 and the peak dose up to 1,000 years was well below the 25 millirem/year performance objective. The State of South Carolina was satisfied with the PA and the sensitivity case showing a potential peak between 25 and 100 millirem/year thousands of years in the future and the State allowed disposal to proceed.

In this case, DOE was expected to conduct additional activities, including spending more than $2 million to obtain waste sample cores for further confirmatory analysis from the disposed waste. In addition to the cost, obtaining the waste sample cores requested for confirmatory analysis also resulted in a total of about 2,700 millirem of worker exposures with the maximum individual exposure of about 250 millirem. If the compliance period had been 1,000 years, the far-future doses could be considered from a more risk-informed perspective, avoiding a need to spend millions of dollars and cause actual worker exposures to address concerns with a potential dose thousands of years in the future that NRC staff specifically stated was "relatively low." In the end, NRC staff's assessment of DOE compliance using the interim guidance to a very specific dose limit thousands of years in the future caused actual doses to real workers now, well above the projected doses that may occur to hypothetical receptors thousands of years in the future that NRC staff considered "relatively low."

The NRC staff application of the 10,000-year dose limits were conveyed to DOE in a monitoring, non-licensing role. It is reasonable to assume that an NRC Agreement State application in a licensing and regulatory context would at least be as stringent and, therefore, costs could be even higher for licensees. This example highlights a number of issues related to

the cost of PA—and, thus, the estimated economic impact of the prior proposed draft final rule—that were not adequately considered by NRC in the draft regulatory analysis.

Additional information and justification is required related to the following aspects, at a minimum:

- NRC's regulatory analysis underestimated the cost for analyses and model support to address compliance with a specific dose limit for a 10,000-year compliance period. If a 10,000-year compliance period is analyzed as an alternative in the revised regulatory analysis, an accurate assessment is needed in order to fully understand the relative cost differences to be expected in moving from the previously proposed 1,000-year and 10,000-year compliance periods to a single 1,000-year compliance period. As discussed above, significant compliance costs -- including research/characterization costs, and worker doses -- were realized by DOE to the net result of not changing any of the conclusions of the technical analysis.
- DOE's experience is that there is a significant difference in the effort and cost needed to construct a quantitative PA to meet a very specific dose limit at 1,000 vs. 10,000 years, as proposed in the proposed draft final rule. The draft regulatory analysis estimates that disposal facilities will spend most of their effort on a 1,000-year PA and one half to one fifth as much additional time and money to meet a very specific dose limit at 10,000 years. As NRC correctly concludes (pp. 15-16), qualitative extension of analyses beyond the period of compliance is considerably less resource-intensive than the PA. However, extension of the quantitative PA to support strict comparison of results against dose limits or targets would be significantly more expensive, given that quantitatively addressing growing uncertainties beyond 1,000 years has proven to require additional and more complex physical sampling, conceptual models, and statistical analyses. The cost to extend analyses to meet specific dose limits for 10,000 years could be as much as, or even more than, development of a 1,000-year PA.
- The current draft regulatory analysis does not account for the actual preparation and review costs incurred by NRC staff when reviewing DOE technical analyses under NRC's consulting and monitoring roles under, for example, section 3116 of the NDAA.
- The draft regulatory analysis underestimates the cost of performing and maintaining a site-specific PA. On page iii, the costs of the draft regulatory analysis, the cost to industry is stated to "average" $1,000,000 per licensee for implementation and $525,000 per Agreement States to oversee the work. Based on DOE experience, this significantly understates the actual costs. In DOE's experience, the cost of conducting an updated PA and added effort to address the items identified in the draft regulatory analysis would significantly exceed $1,000,000, especially when consideration is given to additional iterations associated with reviews and efforts on model support and design due to all the changes that were proposed in the draft final rule. Also, using average costs for different facilities that accept different waste profiles seems inappropriate, given that licensees and Agreement States that do not plan to dispose of large quantities of DU should not be required to conduct the updated analyses.
- On page 10 of the draft regulatory analysis, an average labor rate for PA preparation of $47.31/hour is identified. This seems to be extremely low (by a factor of 2 to 4) relative to DOE experience for fully-burdened technical expertise in this area and could be one reason for the significant underestimate of the overall cost. We recommend that NRC

seek input from licensees and Agreement States to provide a more realistic cost for all activities related to the technical analyses that have been conducted at their commercial radioactive waste disposal facilities with site specific PAs to support DU disposal. When addressing these costs, NRC staff should also acknowledge the multiple iterations and follow-up work that are typically required to support a technical analysis.

- Lastly, NRC concludes (p. iv.) that "waste acceptance criteria should also allow licensees to dispose of material more 'risk efficiently' which is likely to reduce costs." DOE agrees that site-specific waste acceptance criteria can allow some facilities to accept a broader range of waste for safe disposal, which can provide monetary benefits. Additional clarification or examples of "risk efficient" disposal and how costs would be reduced would be beneficial.

Question 5: Are there any costs that should be assigned to those sites not planning to accept large quantities of DU for disposal in the future?

As directed by the Commission, the analysis should include evaluation of alternatives that allow grandfathering for commercial facilities that do not plan to dispose of large quantities of DU. DOE believes that, if a "grandfathering policy" is implemented, new technical analyses would likely not be necessary at operating commercial facilities that are currently in compliance and do not intend to dispose of large quantities of DU. This is a significant cost avoidance as compared to proposed draft final rule.

The regulatory analysis should consider costs to DOE facilities from 10 CFR Part 61 and associated regulatory guidance (NUREG-1854) as applied to DOE under NRC's consulting and monitoring roles for DOE tank closure and disposal actions conducted under Section 3116 of the NDAA. Our answer to Question 4 highlights recent worker dose and cost impact from NRC monitoring on a DOE disposal facility that is not accepting large quantities of DU. Examples of cost impacts that have occurred to date include: collection of additional data, performing additional technical analysis, and development of new PA tools, e.g., methodologies, software models, and model input parameters.

Question 6: Is NRC's assumption that only two existing LLRW sites (i.e., EnergySolutions' Clive Utah disposal facility and Waste Control Specialists' Texas disposal facility) plan to accept large quantities of depleted uranium for disposal in the future reasonable?

DOE is currently analyzing disposal of DOE DU at Energy*Solutions* of Utah and Waste Control Specialists low-level radioactive waste disposal facilities and DOE disposal facilities. DOE does not foresee the need for DU disposal at any other non-DOE disposal facility at this time.

Question 7: What additional costs or cost savings, not already considered in the draft regulatory analysis, will the supplemental proposed rulemaking or alternatives cause to society, industry, and government? What are the potential transfer ("pass-through") costs to the waste generators and processors?

There are a variety of costs that are not considered in the draft regulatory analysis, some of which have been introduced in responses to other questions.

- Ongoing DU storage awaiting this regulatory action. Since December 2009, taxpayers have been paying for storage of about 3,500 tons of DOE DU (5,409 containers) shipped from the SRS and now in storage pending disposal at the Energy*Solutions* of Utah facility, while regulators and the company develop a site-specific PA and revise the disposal license. DOE is paying about $145,869 in fiscal year 2018 for storage, including any repackaging/maintenance associated with containers that need to be repackaged. These storage costs have escalated since 2009 and continue to escalate. Commercial nuclear fuel cycle entities with DU have similar ongoing disposal obligations and costs. Completion of the supplemental proposed rulemaking and implementation will avoid these costs.
- Pass through small disposal rate increases applied to large volumes. Small increases in commercial disposal rates may lead to significant cost increase to the taxpayers/utility ratepayers, well beyond those analyzed, due to the potential large volumes of DU requiring future disposal at DOE or commercial facilities. DOE is currently analyzing the impacts of disposition of up to 880,000 tons (800,000 metric tons) of uranium oxide resulting from the conversion of DU hexafluoride at DOE's two operating conversion facilities in Paducah, Kentucky, and Portsmouth, Ohio.
- Costs impacts for including radon in the performance objective. Radon is a major contributor to background radiation doses, which—in many instances around the world—is one or more orders of magnitude above the proposed 25 millirem/year all pathways performance objective. It is not prudent to spend millions of dollars to limit "potential" radon dose far in the future at a disposal facility to a level roughly 20 times less than levels at which mitigation is recommended (but not required) in homes. While radon concerns can be addressed by increasing the thickness of material above the radon bearing waste, increasing the thickness of cover can come with significant costs. In one example for a relatively simple cover design at a disposal facility in Nevada, DOE estimates that the difference in cost for an increase in cover thickness from 2.5 meters to 3 meters was more than $2 million (an increase from $3.2 million to $5.4 million) for a 70-acre cover. For larger and more complex covers, costs would be expected to be higher. Cost impacts from changes to 10 CFR Part 61 to include radon doses should be fully assessed in the regulatory analysis. DOE seeks a common sense approach consistent with other promulgated rules that specifically exclude radon from dose calculations and instead provide a flux or concentration standard that is applied to radon.
- Closure costs. Another example of costs that appear to be underestimated in the draft regulatory analysis are those associated with developing an updated technical analysis at closure. Page 7 identifies "new requirements for license amendments and site closure," including a requirement to update technical analyses and the "LLRW acceptance plan." Similar to earlier comments, these costs (pp. 16-17) appear to be underestimated. Furthermore, DOE does not believe it should, *a priori*, be deemed essential to revise a technical analysis at closure. For example, if a facility operates within parameters assumed for a technical analysis and there are no significant changes that would impact the conclusions from the existing technical analysis, the existing analysis should remain valid and it would not be necessary to conduct a revised analysis at closure. However, if required, the costs associated with additional iterations of the technical analysis at closure should be included in the revised regulatory analysis.
- Site stability costs. DOE expects additional costs would be incurred if demonstration of site stability was required to 10,000 years. The draft regulatory analysis states (page 9):

"Because NRC regulations already require a site stability analysis, the NRC does not anticipate any additional cost to the licensee from changes to 10 CFR 61.44." DOE does not find this statement credible, particularly if the compliance period were extended from 1,000 to 10,000 years. The range of scenarios, the types of uncertainties, and the potential design measures needed to demonstrate "stability" for 10,000 years are significantly different than for 1,000 years.

- Defense in depth analysis cost. The draft regulatory analysis does not appear to address the costs for conducting a defense in depth analysis.

From:	Tonkay, Douglas
To:	RulemakingComments Resource
Cc:	Marble, Justin; Howard, Terri
Subject:	[External_Sender] Docket ID NRC–2011–0012; US Department of Energy comments on the draft regulatory analysis, "Draft Regulatory Analysis for Final Rule: Low-Level Radioactive Waste Disposal"
Date:	Thursday, November 16, 2017 4:53:05 PM
Attachments:	DOE comments docket NRC 2011-0012.pdf

RE: Docket ID NRC–2011–0012

To whom it may concern:

Please find attached US Department of Energy comments on the draft regulatory analysis, "Draft Regulatory Analysis for Final Rule: Low-Level Radioactive Waste Disposal", focusing on cost and benefit information to better inform the updated draft regulatory analysis.

Cordially yours,

Douglas Tonkay
Director, Office of Waste Disposal
Environmental Management
US Department of Energy