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General Comment

See attached file(s)

Attachments

NRC Part 61 Comments Neptune - 2013-01 rev0

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7 January 2013

Annette Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Rulemakings and Adjudications Staff

Subject: Comments on November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)

Reference: Docket ID NRC–2011–0012

Dear Ms. Vietti-Cook:

Neptune and Company, Inc. (Neptune) is submitting the attached comments in response to the notice published in the 7 Dec 2012 Federal Register Vol. 77, No. 236, pp. 72997 *et seq*. We appreciate the opportunity to comment on the proposed language for 10 CFR 61.

We believe that the revision to 10 CFR 61 is a worthwhile endeavor that will lead to radioactive waste disposal decisions that are more beneficial for and protective of current and future generations.

Thank you again for this opportunity to comment. Questions regarding these comments may be directed to Dr. Paul Black at (866) 245-5040 ext 1 (pblack@neptuneinc.org), or Dr. John Tauxe at (505) 662-0707 ext 15 (jtauxe@neptuneinc.org).

Sincerely,

John Tauxe, P.E., Ph.D. and Paul Black, Ph.D.
Neptune and Company, Inc.

Comments on November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)

Neptune and Company, Inc. (Neptune) appreciates the opportunity to provide comments on the U.S. Nuclear Regulatory Commission (NRC) proposed language for Code of Federal Regulations Title 10 Part 61. We believe the NRC efforts are timely, and that revisions to 10 CFR 61 are sorely needed.

The document entitled *November 2012 Preliminary Rule Language for Proposed Revisions to Low-Level Waste Disposal Requirements (10 CFR Part 61)* was provided for comment, and it contains sections of proposed revisions to the text of Part 61. Revisions are indicated in the document by the use of underlined text, and changed or omitted text is not identified. Also not identified are sections of the rule that are not proposed for revision, but are nevertheless proposed for the rule, by implication. The proposed revisions have implications for most of the rule, and so we consider the entire rule to be "proposed". Some of the following comments therefore are oriented toward parts of 10 CFR 61 that are not discussed in the document provided, but are nevertheless in need of revision.

The comments below are organized into a General Comments section, with application to the overall rule, and a Specific Comments section, with comments following the same order as they appear in the proposed revisions document.

General Comments

Much of the existing language in 10 CFR 61 suffers from being overly vague, and in many cases the proposed language does little to remedy this shortcoming.

Neptune had hoped for greater changes to the regulation. We were hoping that the revised regulation would open the door to performing a proper risk assessment, bringing in site-specific factors, and not tying the performance assessment to conservative unlikely MOP or IHI scenarios. Perhaps the proposed revisions accomplish part of this by providing options for site-specific analyses, but it is not clear that the concepts of MOP and IHI may be abandoned in favor of site-specific exposure scenarios.

The language of Part 61 could still use tightening up. A significant example of this is in the definition of the performance objectives, which apply in the title of § 61.41 to the "general population", but in the text of the same subsection refer to "any member of the public". These terms are quite different from each other, but are sprinkled throughout Part 61 as if they were equivalent. Protection of the "general population" implies that a population risk assessment should be developed, and protection of "any member of the public" implies protection of anyone, including the most vulnerable members of the public. This is different from protecting an "average" member of the public, such as the "reference man" that is commonly used. It is good that the regulation strives to protect both the general population and any member of the public,

and this can be done in a site-specific performance assessment, but the language needs to be cleaned up so that the two concepts are made to be clear and distinct. While the dose to any member of the public can be assessed against the performance objective of an annual maximum of 0.25 mSv, the population dose must be expressed differently. A new section is needed to do this, describing how a population dose is to be evaluated as a summed dose to a large number of individuals—all those receptors that will be exposed to radioactivity from the waste over the entire period of performance. The population dose thus calculated would be expressed in terms of total Sieverts (or rem), and this is to be kept as low as reasonably achievable (ALARA). There is no predetermined value that is acceptable for a total population dose—there is no equivalent to the 0.25 mSv maximum annual dose for individuals. Note also that the term "general population" needs to be better defined in terms of the potentially affected population. The "general population" is too vague. This is another place where changing focus to a risk assessment based on reasonable site-specific exposure/receptor scenarios would be beneficial.

The specific references to a scoping analysis (such as a features, events, and processes, or FEPs analysis) is encouraging. This should be a starting point for a site-specific performance assessment, and mentioning this in the regulation is appropriate. It could benefit from a scoping of human exposure scenarios as well, however, since these are also potentially significant in evaluating compliance with performance objectives. The regulation should not get into specifics, however, as these will vary so much from site to site. Examples of specific features, events, processes, and exposure scenarios (FEPSs) to include should be left to guidance.

If regulations are sufficiently vague or obfuscating, then they can open the door to wider interpretation, so compliance (and optimization) can be demonstrated as long as the performance assessment can be shown to fit the regulation in some reasonable form, and so long as it is demonstrated to be defensible. However, this could be achieved with a simpler regulation that requires a proper risk assessment and provides performance objectives for evaluation of compliance.

As is stands, the current regulation is very difficult to communicate, and consequently, current performance assessments are very difficult to communicate. They have very little basis in perceived reality. What is needed is to replace the concepts of a "member of the public" (MOP) and "inadvertent human intruder" (IHI) with site-specific receptor exposure scenarios and risk assessment. The proposed changes in language still include inconsistencies in the promotion of site-specific analyses.

The current form of CFR 61 was developed over 40 years ago, before the advent of modern computer technology. Because of the rapid change in technology and consequent modeling capabilities, there is a need to move beyond the methods and approaches that underlie the current regulation. The proposed revisions do not accomplish this. They are a small step that, in some ways, seems to allow site-specific analyses to be performed, but is otherwise still tied to and adversely affected by methods and approaches that are out of date. The opportunity to revise regulations does not come along very often. It is important, therefore, not to miss this opportunity, but the current revision does largely miss this opportunity.

Other items relevant to radioactive waste disposal under the purview of the NRC include the effects of the disposals on the environment. Since NRC is tasked with "protecting people and the environment", one might expect that the analyses required in 10 CFR 61 would include ecological risk assessment as well as for human health. Also, in the analyses of long term effects, after the period of performance (currently suggested to be 10,000 years) there loom the inescapable effects of climate change. While prescribing methodologies for taking climate change into account is beyond the scope of regulation (more appropriately falling into the realm of guidance), the fact that climate change must be accounted for in these "deep time" assessments should be touched on somewhere in Part 61.

The proposed changes to Part 61 are marginal, with the primary issues being to accommodate disposal of depleted uranium (DU), to allow site-specific analyses to be performed, and to update the dose conversion factors (DCFs) to current methodology. The door is opened, but there could have been much more done to advance protection of people and the environment.

Specific Comments

§ 61.2 Definitions.

Several terms are used in the existing and the proposed rule language that require definition in this section. These are

- member of the public
- general population
- reasonable assurance
- unacceptable risk
- disposal facility
- disposal site
- disposal unit
- low-activity waste
- high-activity waste
- radiation from the waste

The following existing definitions are proposed for revision, with specific comments following each. We note, again, that if a proper risk assessment is applied, then some of these terms are unnecessary, and the regulation could be simplified and brought in line with modern risk assessment practices. We regard this as a serious flaw in the proposed revision.

Proposed definition:

Inadvertent Intruder means a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling) or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste.

Comments:

We think the distinction between an inadvertent intruder and any other member of the public should be dissolved. It is a completely unhelpful distinction that obfuscates a proper risk assessment. It is difficult to understand how, on the one hand, the revised regulation is meant to convey the need for a "risk informed" analysis, and at the same time require an evaluation of a default or stylized inadvertent human intruder. We think the concept of an inadvertent human intruder should be removed from the regulation, and the risk informed process should, instead, be supported by proper risk assessment to the general population on the basis of the development of reasonable site-specific exposure scenarios. We presume that such a change has not been made because of the tables that exist for intruder analysis. It is unfortunate that this was considered a constraint too powerful to overcome.

Further, use of the word "person" (twice) becomes immediately problematic when the definition of "person" is considered:

> *Person* means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy (except that the Department of Energy is considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to law), any State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

Given this definition of "person", it is hard to imagine that this is all to be considered in the definition of inadvertent intruder, or anyone receiving a dose. A clarification is in order, perhaps by substituting another word for "person".

What is the meaning of the word "occupy" in this context? Does it mean that someone must set up residence on the site, or is a temporary visitation of the site considered an occupation? If a recreational hunter, for example, crosses the site and is unknowingly exposed to waste, or radionuclides that migrated from the waste, is that considered an occupation? Is such a visitor considered an inadvertent intruder? The definition of "inadvertent intruder" remains vague. This also requires clarification. This confusion would disappear if a risk-based approach were to be taken.

Use of the terms "reasonably foreseeable" and "might" makes this definition quite vague in practice. Is it left up to the applicant to determine what constitutes "reasonable foreseeable pursuits", and what "might" means in this context? Is an inadvertent intruder one who "might occupy the disposal site", or one who actually "occupies the disposal site"? Our recommendation is that the "foreseeable future" should be defined site-specifically by the local (potentially affected) population and by considering economic arguments. This is how society operates in practice in our everyday lives.

Finally, the phrase "radiation from the waste" is problematic in the context of inadvertent intrusion. Does this mean radiation only from the waste that is still in place as it was disposed?

What if the waste has migrated, or what if the radionuclides that originated in the waste have migrated to a location where the intruder might come into contact with it, or at least be irradiated by it? Consider that radionuclides from the waste may have migrated to the ground surface, or to surface waters, and that such radionuclides would irradiate anyone who might traverse the area. Is such an individual to be considered an inadvertent intruder?

Ultimately, the distinction between an inadvertent intruder and other members of the public, or the general population, becomes blurred. We recommend that the concept of the inadvertent intruder be abandoned, replaced by a performance assessment that assesses risks to populations of individuals that are expected to occur at any given site. Such an approach would be far easier to communicate to the stakeholders, which is very important to gain approval and hence be able to open a disposal facility.

Proposed definition:

Intruder assessment is an analysis that (1) assumes an inadvertent intruder occupies the site or contacts the waste and engages in normal activities or other reasonably foreseeable pursuits that might unknowingly expose the person to radiation from the waste; (2) examines the capabilities of intruder barriers to inhibit an inadvertent intruder's contact with the waste or to limit the inadvertent intruder's exposure to radiation; and (3) estimates an inadvertent intruder's potential annual dose, considering associated uncertainties.

Comments:

Given our views on the concept of the inadvertent intruder (above) it will be no surprise that we feel that the definition of an "intruder assessment" as distinct from a "performance assessment" is not needed. If a performance assessment examines all site-specific exposure scenarios, then it will naturally account for all receptors as part of the general population, be they "intruders" or "members of the public". This is overcomplicating what should be a straightforward problem.

Proposed definition:

Long-lived waste means (1) waste where more than ten percent of the initial radioactivity remains after 10,000 years (e.g. long-lived parent), ...

Comments:

If applied to a single radionuclide with no progeny, this would correspond to a half-life of just over 3000 yr. That calculation is useful just to get an idea of what is considered long-lived by this definition. However, perhaps the intent is to account for a "waste" that may contain quite a lot of various radionuclides in various concentrations, in any combination. It is difficult to assess the reasonableness of this definition without examining sample recipes of waste. We trust that this has been done, and that NRC is comfortable with the implications of this definition.

Proposed definition:

Performance period is the time after the compliance period for disposal facilities during which the performance objectives specified in §§ 61.41(b) and 61.42(b) must be met.

Comments:

A performance period is not necessary if a proper risk analysis, including an economic analysis, is performed. However, if such a concept is to be included, then it needs greater definition. There is also an implication in this definition that dose will be tied to performance objectives even within this period. This is completely unnecessary. This begs the question of how "foreseeable future" is defined and for what purpose. It might be an interesting exercise to evaluate concentrations beyond the Compliance Period, but a dose comparison should not be performed. Given the rapid changes that are likely to continue in society and technology, the assumptions concerning characteristic of humans that far into the future cannot be defended.

Proposed definition:

Compliance period is the time during which compliance with the performance objectives specified in § 61.41, § 61.42 and § 61.44 must be demonstrated. This period ends 10,000 years after closure of the disposal facility

Note that the same is the case for the Compliance Period. A proper economic or decision analysis performed under ALARA would not require specification of a Compliance Period. However, if a Compliance Period is to be used as an anchor in this way, then a shorter time frame than 10000 yr, for example, 1000 yr, likely corresponds better to the idea of a "foreseeable future".

Proposed definition:

Site closure and stabilization means those actions that are taken upon completion of operations that prepare the disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

Comments:

It is not clear how such assurance can be provided. The language should be softened to explain the true intent. It is not possible to guarantee (assure) that stability will be maintained and that ongoing active maintenance will not be needed. Inserting the word "reasonably" in front of "assure" would at least make this consistent with other language in the rule.

Proposed definition:

Stability means structural stability.

Comments:

This definition is self-referential, and not particularly useful, even though we realize that the proposed revision is simply to correct a spelling error. The definition begs for discussion. What is the issue, actually? Is it exposure of the waste that is of concern? What about structural changes that do not release waste? What if waste is exposed to the environment through a structural failure but no one is exposed, and there is no dose or risk? Is the concern about stability simply for stability's sake?

This issue is raised again in 61.7(e) below, which further defines stability as minimizing contact with water (not really a structural stability issue), and also states that stability "isn't necessary from a health and safety standpoint for most waste..." Well, if it is not necessary, what is the need for stability?

Since the regulation is supposed to support risk-informed decision making, it seems that the subject of site stability should also be framed in terms of risk. The basic definition in §§ 61.44 indicates that the intent is to "eliminate to the extent practicable the need for ongoing maintenance of the disposal site following closure, so that only surveillance, monitoring, or minor custodial care are needed". This, by itself, is a far better definition of site stability. Although it would be better again to regulate such that measures of site stability correspond to risk (dose).

§ 61.7 Concepts.

Proposed language:

§ 61.7(a) The disposal facility. [The contents of (1) and (2) are not reproduced here.]

Comments:

Sections 61.7(a)(1) and (2) clearly define the terms "disposal facility", "disposal site", and "disposal unit", but the use of these terms in the entire Part 61 seems to be inconsistent at times. Inconsistencies are identified in the comments below as they are identified. The entire text should be carefully reviewed to assure consistency in the use of these terms.

Proposed text:

§ 61.7(a)(2) ... In choosing a disposal site, site characteristics should be considered in terms of the indefinite future, take into account the radiological characteristics of the waste, and be evaluated for at least a 500-year timeframe.

Comments:

It is not clear what this means. How does this relate to the concept of a Compliance Period or a Performance Period? If a performance assessment is to estimate doses or risks for 10,000 years into the future, why would site characteristics be evaluated for only a 500-yr time frame?

§ 61.7(b) Performance objectives. Disposal of radioactive waste in land disposal facilities has the following safety objectives: protection of the general population from releases of radioactivity, protection of inadvertent intruders, protection of individuals during operations, and ensuring stability of the site after closure. Achieving these objectives depends upon many factors including the design of the land disposal facility, operational procedures, characteristics of the environment surrounding the land disposal facility, and the radioactive waste acceptable for disposal.

Comments:

We think that the concept of an inadvertent intruder should be removed, and the performance assessments should be aimed at doing a reasonable risk assessment. Protection of individuals during operations is handled through worker safety, and site stability can be folded into the risk assessment. Presumably a site is would be judged sufficiently stable if the risks are low enough, or is there another reasonable approach to evaluating site stability?

Protection of the "general population" is called for, but, as pointed out above, this is different from protection of "any member of the public", which is required in § 61.41. Again, a clarification of terms is needed. This seems to imply that the performance assessment should perform a population risk assessment, as opposed to (or perhaps in addition to) an assessment of dose to an individual. This is in concordance with the title of § 61.41: Protection of the general population from releases of radioactivity. That title also seems to suggest that a population dose assessment is in order. As discussed in the comments below for that section, however, this is in conflict with the text within that section, which mentions dose to "any member of the public". The point of this comment is that the "general population" is in practice quite different from "any member of the public". Since § 61.7 discusses concepts, it would be good to clarify the intent of the rule here as well as in § 61.41.

Note that we support the need to perform a population risk (dose) assessment to support decision making, whether performed using the principles of ALARA or otherwise. Ultimately, siting of disposal sites was done by considering population risks.

The proposed text also neglects to identify the significance of human behavior and demographics in the assessment of risk to the general population and inadvertent intruders. These are among the "many factors" that should be mentioned specifically.

Proposed text:

§ 61.7(c)(1) Demonstrating compliance with the performance objectives requires assessments of the site-specific factors including engineering design, operational practices, site characteristics, and radioactive waste acceptable for disposal. ...

Comments:

Demonstrating compliance requires assessment of site-specific factors. How is that reconciled with the evaluation of an inadvertent intruder who represents an exposure scenario that is not reasonable at a particular site? This clause is a step in the right direction, but other parts of the regulation need to catch up. An alternative is to leave it sufficiently vague that the applicant will address sufficiency of the analysis, so long as the analysis can be shown to fit the regulation in some reasonable form (i.e., demonstrate that the analysis is defensible).

Proposed text:

§ 61.7(c)(2) A performance assessment is an analysis that is required to demonstrate protection of the general population from releases of radioactivity.

Comments:

In the following sentences of this section, the term “site” is used twice, as is the term “facility”. Now that these terms have been carefully defined, care should be taken that they are used intentionally in this section. All occurrences in this section should probably use “site”.

Again, the term “general population” is used when it may not be what is actually intended.

The phrase “...that is required to demonstrate...” could be shortened to simply “...that demonstrates...”

Proposed text:

§ 61.7(c)(3) It is possible, but unlikely, that persons might occupy the site and engage in normal pursuits without knowing that they were receiving radiation exposure.

Comments:

This sentence has several problems. First, why is this considered “unlikely”? The likelihood of someone occupying the site (again, “person” is probably misused here, and “occupying” still requires definition) is quite site-specific. The word “unlikely”, used here with no quantification, is rather meaningless. Some waste disposal sites are much more likely to be encountered by humans than others, and some less likely. What is “unlikely” is completely a relative term. The words “but unlikely” should simply be removed, since for all sites future visitation by humans is certainly possible. That said, the idea that receptors have a likelihood of visiting (or occupying) the site is important, and should in fact become part of the site-specific performance assessment. The fact that remote or harsh sites are less likely to be occupied is an important factor. The likelihood of occurrence of a visitation or occupation scenario is less than unity, and this should be taken into account. This occurs naturally if a performance assessment considers the comings and goings of various types of receptors with various attributes and behaviors (the “normal pursuits”. The risk to each individual can thereby be assessed, as can the risk to the entire population of individuals. Of course, these individuals are projected into the future based on current societal conditions, and it would be good to clarify that is how a PA must be conducted – that is, project current conditions/knowledge into the foreseeable future.

In this sentence, persons (labeled “inadvertent intruders”) would not know “that they were receiving radiation exposure”. But at the end of the paragraph for (3), mention is made of “some form of intruder barrier that is intended to prevent contact with the waste.” The problem here is that “receiving radiation exposure” is different from “contact with the waste”. A future human could be some distance from the waste, at least from where it was originally placed, and still be exposed to radiation, while being exposed to radionuclides that have migrated away from the waste, or the progeny of those radionuclides. This begs the question of what is meant by “waste”. Is it the waste form itself as disposed, or is it the radionuclides that were at one time part of the waste? This lack of firm definition plagues the bulk of Part 61. These details may seem trivial to the casual reader, but they are critical to the analyst who must develop assessments that address the performance objectives in detail.

And, we again suggest removing inadvertent intrusion as a concept, and replacing with the need for a site-specific risk assessment, which should include human intrusion into the waste if that is

part of reasonable site-specific exposure scenarios. This would simply mean removing §§ 61.42 and revising §§ 61.41 towards a risk assessment.

Proposed text:

§ 61.7(c)(4) Demonstrating protection of inadvertent intruders requires an assessment of potential radiological exposures should an inadvertent intruder occupy the disposal facility following a loss of institutional controls after closure.

Comments:

This sentence is essentially tautological, since an inadvertent intruder, by definition, occupies the disposal site (not "the disposal facility", mind you) after the loss of institutional control, which also by definition occurs after closure. Note that institutional control applies to the site, but not to the facility.

Proposed text:

§ 61.7(c)(4) [continued] An intruder assessment can employ a similar methodology to that used for a performance assessment, but the intruder assessment must assume that an inadvertent intruder occupies the disposal site following a loss of institutional controls after closure, and engages in activities that unknowingly expose the intruder to radiation from the waste.

Comments:

This introduces yet another spin on the concept of future humans encountering radiation. Here, the intruder might unknowingly be exposed to "radiation from the waste". This continues to beg the question of what the waste is, where the radiation might be. Do radionuclides that have migrated away from the waste into the environment constitute "radiation from the waste"?

This also suggests that an intruder assessment is a different analysis from a performance assessment. This is indeed a new concept, as intruder analysis has always been part of performance assessments in the past. Is the applicant expected to develop separate analyses, and even separate documents, for an intruder assessment and a performance assessment?

This language also appears to require that an intruder assessment be performed at a site as if the scenario will happen. That is, a probability of 1. Is this the intent? If so, how is this reconcilable with the requirement to evaluate site-specific factors in § 61.7(c)(1), and the implication that there is a likelihood to occupation hinted at in § 61.7(c)(3)?

We recommend that this proposed text be removed.

Proposed text:

§ 61.7(c)(5) Waste with significant concentrations and quantities of long-lived radionuclides may require special processing, design, or site conditions for disposal. Demonstrating protection of the general population from releases of radioactivity and inadvertent intruders for [?] the disposal of this waste requires an assessment of long-term impacts.

Comments:

This is an example of vague language that is not helpful in a regulation. What does “significant concentration and quantities” mean? How is the significance evaluated except by performing an assessment of long-term impacts? It seems that the assessment must be done in order to determine if the assessment must be done. “Concentration” could mean concentration in the waste form, or in environmental media such as water, air, soil, or rock. “Quantities” could refer to activities, masses, or volumes. Perhaps what is really meant is that for any disposed waste, an assessment should be done in order to determine the long-term (and indeed short-term) impacts, and special processing, design, or site conditions should be modified in order to mitigate unacceptable impacts. If the assessment is to be performed anyway, then just say that the assessment must be performed.

The rest of § 61.7(c)(5) continues in this vein, discussing “limited quantities of long-lived waste”. It says that “...conditions should be evaluated on a case-by-case basis to determine whether analyses beyond the compliance period would be required.” It seems to say than an evaluation should be done in order to determine if an analysis should be done. Again, just rely on the performance assessment for the analysis and be done with it, and require that the performance assessment actually conduct a risk assessment.

And, again we have yet another variation in wording regarding what we are protecting against. In this case, we are to protect the general population from “releases of radioactivity.” Is the general population to be protected only from radioactivity that is released from the waste? What happens in cases where the general population comes into direct contact with the waste (which can happen in certain scenarios)? And further, the distinction between the “general population” and an “inadvertent intruder” becomes blurred.

Proposed text:

§ 61.7(d) Waste acceptance. Demonstrating compliance with the performance objectives also requires a determination of criteria for the acceptance of waste. The criteria can be determined from the results of the site-specific analyses that demonstrate compliance with the performance objectives for any land disposal facility or, for a near-surface disposal facility, the waste classification requirements of Subpart D of this part.

Comments:

The need for a site-specific assessment is indicated for specification of waste acceptance criteria (WAC). This continues the confusion in the document that sometimes default (intruder) scenarios are required, and sometimes site-specific analyses are required. This can all be cleaned up by simply requiring that a risk assessment be performed with associated Performance Objectives. (We presume the difficulty with such an approach is the waste classification tables and associated derivation that exist in the current regulation, and that need to be maintained at this time. If that is the case, then the clean up that is needed can refer to intruders, for example, for specific evaluation but on a site-specific basis.)

Proposed text:

§ 61.7(e)(1) A cornerstone of the waste classification system is stability—stability of the waste and the disposal site—which minimizes the access of water to waste that has been emplaced and covered. Limiting the access of water to the waste minimizes the migration of radionuclides, which may avoid the need for long-term active maintenance and reduces the potential for release of radioactivity into the environment. While stability is desirable, it isn't necessary from a health and safety standpoint for most waste because the waste doesn't contain sufficient radionuclides to be of concern.

Comments:

This seems contradictory, in saying that stability is both a cornerstone of the waste classification system and that stability is not necessary. It also extends the original definition of "stability" (in 61.2, which says that stability means "structural stability") to claim that stability minimizes the access of water to waste. This seems to be confusing different concepts. Structural stability means that the site will not collapse, as in subside or erode—that it will retain its shape and strength. That really has little to do with keeping water out. Further, this focus on water belies a humid site bias—that water is universally the most significant process for contaminant transport in radioactive waste disposal. There are sites where water has a minor or even insignificant role to play—where, for example, biotically-induced transport or gas phase diffusion is of far greater significance than waterborne transport.

Structural stability has another unspoken but much more significant role: It keeps the waste from being exposed to the environment and especially from being directly exposed to human receptors. That function of stability is not even mentioned in this section.

It is somewhat jarring to read that "most waste ... doesn't contain sufficient radionuclides to be of concern." If that is the case, when what is all the fuss about in creating regulations for it in the first place? Perhaps this is just a confusion generated by poor presentation of context, however, as this section eventually seems to identify the waste under discussion as Class A waste, in the next part.

Why is site stability an issue? If it's tied to potential risk (dose), then that could make sense. But requiring stability with no metrics does not make sense, and the metrics should be dose or perhaps long term costs. The language in §§ 61.44 already provides the necessary impetus for framing site stability in the context of risk (dose): "The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required."

Proposed text:

§ 61.7(e)(1) [continued] This low-activity waste (e.g. ordinary trash-type waste) tends to be unstable, which can become a problem with high activity waste of long-lived low-activity waste. If lower activity waste is mixed with the higher activity waste, the deterioration of unstable waste could lead to the failure of the system. The failure of the system could permit water to penetrate the disposal unit, which may cause problems with higher activity waste..

Comments:

This further confuses concepts. The real concern seems to be stability, which again is couched in terms of water even though it should not be assumed that water is the principal mode of contaminant transport at any given site. But, water aside, stability of the system (meaning the site, one presumes) may be compromised by unstable waste. Fair enough—so the operator should not mix structurally unstable waste with structurally stable waste. Activity has nothing to do with it, except that apparently we are not to be overly concerned with unstable low-activity waste, since it is not "of concern". If the classification of waste is driven by stability, which this section seems to imply, then let it be defined by stability, and not by concentration of specific radionuclides. Having classification tables based on radionuclide concentrations does not make sense if the real driving factor is structural stability of the wastes. Also, a properly formed risk assessment would take care of all of this, since it should factor in stability of waste.

Isn't "ordinary trash-type waste" what goes in a municipal landfill? This term is undefined and potentially misleading.

The language in this section goes on to discuss unstable Class A waste as opposed to stable Class A waste, but makes no formal definitions of what "stability" means. § 61.2 defines stability only as "structural stability", which is a pretty useless definition. Here, at least somewhat more of a definition is provided ""to maintain gross physical properties and identity [for] over 300 years." And, is this :stability" meant to apply to the waste form itself, or to the disposal unit (or perhaps even disposal site) as a whole?

In general, waste classification is an anachronism that needs to be abandoned at some point. The classification scheme is no longer necessary, now that site-specific risk assessments can be performed fairly routinely.

Proposed text:

§ 61.7(e)(1) [continued] The stability of long-lived waste may be more uncertain and require more robust technical evaluation of the processes that are unlikely to affect the ability of the disposal system to isolate short-lived waste.

Comments:

Again, are we concerned with the stability of the waste itself, or that of the disposal system (disposal unit or site)? What does stability of the waste imply here? Is this relative to migration potential? Again, lots of concepts not clearly separated in here.

Proposed text:

§ 61.7(e)(1) [continued] For long-lived waste and certain radionuclides prone to migration, a maximum disposal site inventory based on the characteristics of the disposal site may be established to limit potential exposure.

Comments:

This seems to imply the need for site-specific assessment again, but that is not made clear. It also ties site stability with risk for the first time (limit potential exposure). This idea should be expanded upon, and site stability as a concept should be tied to risk (dose).

Proposed text:

§ 61.7(e)(2) Institutional control of access to the site is required for up to 100 years This permits the disposal of Class A and Class B waste without special provisions for intrusion protection, since these classes of waste contain types and quantities of radioisotopes that will decay during the 100-year period and will present an acceptable hazard to an intruder.

Comments:

If Class A and Class B wastes are so benign, one might ask rhetorically, then why is a performance assessment needed? It seems that this clause needs to be revised, especially since depleted uranium (DU) is currently (and apparently will continue to be, following these proposed revisions) considered a Class A waste. If Class A waste disposal is basically no more than a landfill, then why are all of these protections implied in this regulation being taken at great cost to the taxpayer? The regulation should be grossly simplified if this is the case.

Since DU is still defined as a Class A waste after all these revisions, it is not accurate to state that "these classes of waste contain types and quantities of radioisotopes [sic] that will decay during the 100-year period and will present an acceptable hazard to an intruder".

On an editorial note, the word "radioisotopes" should be replaced with "radionuclides" to maintain consistency with the rest of the rule and to be correct. Usage of "radioisotopes" should be restricted to discussions of actual isotopes (which by definition are all the same chemical element).

Proposed text:

§ 61.7(e)(3) Waste that will not decay to levels that present an acceptable hazard to an intruder within 100 years is designated as Class C waste. Class C waste must be stable and be disposed of at a greater depth than the other classes of waste so that subsequent surface activities by an intruder will not disturb the waste. Where site conditions prevent deeper disposal, intruder barriers such as concrete covers may be used. The effective life of these intruder barriers should be 500 years.

Comments:

The choice of 500 years for the effective life of a concrete barrier seems arbitrary. Concrete materials will often last much longer than this, but at any rate will last longer in some environments than others. As part of a site-specific performance assessment, it seems that a given site should take into consideration whatever local conditions dictate the effective life would be. In general, arid sites will enjoy longer effective life for cementitious materials than will humid sites, and this difference, like so many other site-specific differences, should be take into account in the performance assessment. Specifying that they should be effective for 500 years is just another example of subverting the goal of using site-specific information to support

a performance assessment. Perhaps this could be rephrased to “at least 500 years”.

If it is true that “waste that will not decay to levels that present an acceptable hazard to an intruder within 100 years is designated as Class C waste”, how is DU not a Class C waste? It decays to levels that are increasingly hazardous for over 2 million years. “Decay” does not imply a reduction in hazard.

It is also not clear why Class C waste must be disposed at greater depth. This statement is too general. A performance assessment should be performed, no matter the waste stream, to determine if a waste stream can be disposed in a given disposal configuration or engineered system. This also seems to presume that the pathway of interest is unvaryingly upwards. This might not be the case—for example, it is not clear that disposing deeper in a system that has potable groundwater at, say 5 meters below ground surface, would make sense.

Proposed text:

§ 61.7(e)(3) [continued]... Disposal of this waste will be evaluated on a case-by-case basis with the long-term analyses required in § 61.13(e).

Comments:

The language in this clause also implies that a performance assessment with a Compliance Period of 10,000 years is totally unnecessary for anything other than waste that is greater than Class C. How does this address the issue of DU, or large quantities of Tc-99 or I-129 for example (which are classified only by concentration, not quantity)? Why are the many details of this regulation necessary for anything other than greater than Class C waste given this clause? Again, all of this would be simplified if the regulation simply required a site-specific risk assessment. And, that would be easier to communicate.

Proposed text:

§ 61.7(e)(4) Regardless of the classification, some waste may require enhanced controls or limitations at a particular land disposal facility to provide reasonable assurance that the waste will not present an unacceptable risk over the compliance period. A performance assessment and an intruder assessment are used to identify these enhanced controls and limitations, which are site-and waste-specific. Enhanced controls or limitations could include additional limits on waste concentration or total activity, more robust intruder barriers (such as burial below 30 meters), and waste-specific stability requirements. These enhanced controls or limitations could mitigate the uncertainty associated with the evolutionary effects of the natural environment and the disposal facility performance over the compliance period.

Comments:

This newly introduced clause appears to have been written to accommodate DU. The same general concepts should be applied to all waste, however, since this clause is essentially requiring that a site-specific performance assessment be performed. The intruder assessment is also site-specific according to this language. Again, simplification of the regulation to require a properly formed probabilistic risk assessment would avoid the need for so many clauses, and

would facilitate better communication.

Proposed text:

§ 61.7(f)(3) During the period when the final site closure and stabilization activities are being carried out, the licensee is in a disposal site closure phase. Following that, for a period of five years, the licensee must remain at the disposal site for a period of post-closure observation and maintenance to assure that the disposal site is stable and ready for institutional control. The Commission may approve shorter or require longer periods if conditions warrant. At the end of this period, the licensee applies for a license transfer to the disposal site owner.

Comments:

In the context of a 10,000-year Compliance Period, it is not clear how it is helpful to have a five-year post-closure period. In general, the language in § 61.7(f) is very vague. Time frame is not well defined, and the nature and intent of the monitoring program is not well defined. It might be better to use some of the concepts from the DOE and from NUREG/CR-6948 on long-term PA maintenance, reduction in uncertainty, etc. to provide a technical framework and basis for long term monitoring and maintenance.

Proposed text:

§ 61.7(f)(4) After a finding of satisfactory disposal site closure, the Commission will transfer the license to the State or Federal government that owns the disposal site. If the Department of Energy is the Federal agency administering the land on behalf of the Federal government the license will be terminated because the Commission lacks regulatory authority over the Department for this activity. Under the conditions of the transferred license, the owner will carry out a program of monitoring to assure continued satisfactory disposal site performance, physical surveillance to restrict access to the site, and carry out minor custodial activities. During this period, productive uses of the land might be permitted if those uses do not affect the stability of the site and its ability to meet the performance objectives. At the end of the prescribed period of institutional control, the license will be terminated by the Commission..

Comments:

In this section, a "program of monitoring to assure continued satisfactory disposal site performance" is specifically mentioned. NRC would do well to broaden the concept of monitoring to encompass more than simply sampling for radionuclides that are headed for the fence line. As pointed out in NUREG/CR-6948, monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, and ultimately to receptor exposures. This could include, for example, monitoring for excessive water content in unsaturated materials, or a particularly dense population of deeply-rooted plants, if these are known to contribute to human exposures. This is addressed further in § 61.12(l).

If a decision analysis structure based on a properly formed risk assessment were required, then all decisions concerning disposal of radioactive waste could be optimized (disposal, closure) and long term monitoring programs could be designed with stopping rules. Otherwise, long-term

monitoring could continue indefinitely. As such, the performance assessment would become the decision document that it should be.

What happens to the site after the license has been "terminated by the Commission"? Is it assumed that the site poses no further risk to the public? How can the license ever be terminated in a case where risks continually grow in time, such as for the disposal of DU?

Proposed text:

§ 61.7(g) Implementation of dose methodology. The dose methodology used to demonstrate compliance with the performance objectives of this part shall be consistent with the dose methodology specified in the standards for radiation protection set forth in Part 20 of this chapter. After the effective date of these regulations, applicants and licenses may use updated factors, which have been issued by consensus scientific organizations and incorporated by the U.S. Environmental Protection Agency into Federal radiation guidance. Additionally, applicants and licensees may use the most current scientific models and methodologies (e.g., those accepted by the International Commission on Radiological Protection) appropriate for site-specific circumstances to calculate the dose. The weighting factors used in the calculation of the dose must be consistent with the methodology used to perform the calculation.

Comments:

Exactly how does the dose methodology relate to "reasonable assurance that the waste will not present an unacceptable risk"? Again, the terms "dose" and "risk" are assumed to be equivalent, and yet they are not. Risk, which we agree should be the proper metric for assessment and compliance, includes more than just dose. For example, many radioactive wastes contain uranium, or decay to lead, both of which present toxicity risks to exposed humans. Since they are part of the waste, either as disposed or through decay, the risk presented by the waste should include this toxicity. If NRC wishes to ignore toxicity risks presented by substances that are integral to the waste (e.g. uranium and lead) then it should restrict its language in Part 61 (and perhaps indeed in Title 10) to the language of dose, not risk. These are conceptually different.

This section also seems out of place here after the discussion on closure and monitoring under institutional control. It should be moved up, and everything else moved down.

§ 61.12 Specific Technical Information

Proposed text:

§ 61.12(a) A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must include geologic, geotechnical, geochemical, geomorphological, hydrologic, meteorologic, climatologic, and biotic features of the disposal site and vicinity.

Comments:

The second sentence should also include the word "demographic". We also suggest adding this sentence: "These features, events, processes, and exposure scenarios must be related to their

respective roles in both migration of and human exposure to radionuclides originating in the disposed waste."

Proposed (existing) text:

§ 61.12(b) ... For near-surface disposal, the description must include those design features related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes, and covers; contact of wastes with standing water; disposal site drainage; ...

Comments:

Somewhere in there should also be added "occurrence and activity of biota;".

Proposed (existing) text:

§ 61.12(e) A description of codes and standards which the applicant has applied to the design and which will apply to construction of the land disposal facilities..

Comments:

Change first occurrence of "which" to "that". This particular grammatical error seems to have been proposed for revision on other parts of Part 61. This one should be changed, too.

Proposed (existing) text:

§ 61.12(g) A description of the disposal site closure plan, including those design features which are intended to facilitate disposal site closure and to eliminate the need for ongoing active maintenance.

Comments:

Is should be acknowledged that in some cases it is not possible to "eliminate the need for ongoing active maintenance" (e.g. for wastes that pose ever-increasing risks). NRC should acknowledge that there will be cases when sites require perpetual maintenance.

Also, change "which" to "that".

Proposed (existing) text:

§ 61.12(j) A description of the quality assurance program, tailored to LLW disposal, developed and applied by the applicant for the determination of natural disposal site characteristics and for quality assurance during the design, construction, operation, and closure of the land disposal facility and the receipt, handling, and emplacement of waste.

Comments:

Of equal importance is the quality assurance applied to the performance assessment (and intruder assessment, if this is to exist). Language should be added to this effect.

Proposed (existing) text:

§ 61.12(l) A description of the environmental monitoring program to provide data to evaluate potential health and environmental impacts and the plan for taking corrective measures if migration of radionuclides is indicated.

Comments:

As mentioned above in the discussion of § 61.7(f)(4), NUREG/CR-6948 demonstrates that monitoring can and should include key elements of those processes that are known to be sensitive in the performance assessment in contributing to migration of radionuclides, or more to the point, risks to future humans.

The change to § 61.12(l) that we would recommend, then, is to include more than simply monitoring for the migration of radionuclides. Once a sensitivity analysis of a probabilistic performance assessment is completed, the most significant features, events, processes, (FEPs) and exposure scenarios (FEPSs) in contaminant transport and human exposure can be identified, and it is these FEPSs that can be monitored (perhaps indirectly) to flag conditions that would lead to migration of radionuclides. It is best to mitigate migration pathways before migration has occurred. Language to this effect could be added to this section.

§ 61.13 Technical Analyses

Proposed text:

§ 61.13(a)(1) Consider only features, events, and processes that might affect demonstrating compliance with § 61.41(a).

Comments:

This language implies a scoping analysis, commonly known as a FEPs analysis. We would modify the language to include phenomena related to human exposures, as in “features, events, processes, and exposure scenarios”.

Proposed text:

§ 61.13(a)(2) Consider the likelihood of disruptive or other unlikely features, events, or processes for comparison with the limits set forth in § 61.41(a).

Comments:

We agree that consideration of likelihood of specific FEPS in scoping, as well as in site-specific performance assessment, is critical. The question is, how to evaluate the likelihood, and how to use it to screen out FEPs. For Yucca Mountain, for example, the likelihood was quantified to justify omission of some FEPs. The question remains here of what exactly is being required.

Again, we would suggest modifying the language to include “features, events, processes, and exposure scenarios”.

Consequence should also be considered. If the consequence is very small, then a high likelihood

(probability) will not matter to the overall performance. However, it also raises the issue of how to measure and evaluate consequence. This can only be done formally in the context of using performance assessment as a decision analysis.

Proposed text:

§ 61.13(a)(3) Provide a technical basis for either inclusion or exclusion of degradation, deterioration, or alteration processes (e.g., of the engineered barriers, waste form, site characteristics) and interactions between the disposal facility and site characteristics that might affect the facility's ability to meet the performance objective in § 61.41(a).

Comments:

It's not clear why this is being separated out, as this is a natural part of the FEPs scoping process. It could be eliminated because it is already covered by the FEPs process additions, and because Part 61 is meant to be regulation, not guidance. This entire section has become guidance it seems. The regulation would be better served by requiring a reasonable risk assessment (which should naturally include a scoping analysis) and providing performance objectives for comparison. This type of technical guidance should be removed.

If it is to remain, the word "naturalization" should be added after "degradation", since it does not have a negative connotation. As discussed extensively during the NRC Workshop on Engineered Barriers in August 2010, the change of engineered barriers (and other parts of the system) to move toward natural conditions is not always detrimental to performance, and in any case must be recognized.

Proposed text:

§ 61.13(a)(4) Provide a technical basis for models used in the performance assessment such as comparisons made with outputs of detailed process-level models or empirical observations (e.g., laboratory testing, filed investigations, and natural analogs).

Comments:

This is a surprise as well. Why is this in the regulation? It is worthwhile, but not as part of the regulation. This is technical guidance.

It also would be good to specify what sorts of models are meant, here. It seems that it would mean computational models, but it could apply to conceptual models or mathematical models as well. Perhaps it should.

Proposed text:

§ 61.13(a)(5) Evaluate pathways including air, soil, groundwater, surface water, plant uptake, and exhumation by burrowing animals.

Comments:

There is a mix of categories, here. Some of these are contaminant transport processes (plant

uptake and exhumation by burrowing animals) but the others (air, soil, ground water, and surface water) are environmental media, rather than pathways or processes. Contaminant transport processes within these media might be diffusion, advection, chemical partitioning, etc. This distinction could be made. One drawback to include these, and only these, is that the list may become dated. As we learn more about the world of radionuclide contaminant transport, we find previously unknown or at least underappreciated mechanisms. For example, the only biotic pathways mentioned here are for plants and animals, but the potentially significant roles of mycological and microbiological entities are only now beginning to be appreciated.

Again, this is technical guidance and not regulation (it opens the door to dealing with biota, which is a good thing, but should be in guidance rather than regulation). As such, its presence in the regulation may not be appropriate. If it is retained, it should use more general language, rather than calling out specific mechanisms or materials.

Change "groundwater" to "ground water" in keeping with established NRC style.

Proposed text:

§ 61.13(a)(6) Account for uncertainties and variabilities in the projected behavior of the disposal system (e.g., disposal facility, natural system, and environment).

Comments:

This appears to be requiring a probabilistic performance assessment. However, nothing else in the regulation explicitly requires this. Obviously, we think this is needed, but some other adjustments to the regulation are really needed to go along with this.

As a companion section, we would also propose the following (to follow § 61.13(a)(6):

§ 61.13(a)(6½) Account for uncertainties and variabilities in the projected demographics and behavior of human receptors.

Since the principal performance objectives for future humans is one of dose (or risk) to any member of the public (and/or to the general population), uncertainties and variabilities in the human element must be considered. These have the potential to be of greater significance than disposal system behavior in determining the risk and its uncertainty.

Proposed text:

§ 61.13(a)(7) Consider alternative conceptual models of features and processes that are consistent with available data and current scientific understanding, and evaluate the effects that alternative conceptual models have on the understanding of the performance of the disposal facility.)

Comments:

In addition to alternative conceptual models, alternative implementations as mathematical models could be considered (e.g. various representations of porous medium tortuosity). This

could further be extended to alternative computational modeling implementations. The same system could be modeled as a system model, or as a process model using finite-difference, finite-element, or some other discretization paradigm. Solutions could be implicit, explicit, or hybrid. All of these variations could produce somewhat different results, and all will no doubt evolve as better technologies are developed. The question is how far do we want to take this evaluation of alternative approaches? Perhaps the proposed language is sufficient.

At any rate, this is guidance, not regulation. It is not useful for the regulation to instruct analysts to merely "consider" an approach, but it would also be inappropriate to here require that specific approaches be tried.

If this section is to remain, then we would further suggest that "features and processes" be expanded to "features, processes, and exposure scenarios" so that alternative conceptualizations of the human element would be considered.

Proposed text:

§ 61.13(a)(8) Identify and differentiate between the roles performed by the natural disposal site characteristics and design features of the disposal facility in limiting releases of radioactivity to the general population.

Comments:

While this is an important activity to be performed as part of performance assessment, this is again guidance, not regulation.

Proposed text:

§ 61.13(b) Analyses of the protection of inadvertent intruders that demonstrate there is reasonable assurance the waste acceptance criteria developed in accordance with § 61.58 will be met, adequate barriers to inadvertent intrusion will be provided, and any inadvertent intruder will not be exposed to doses that exceed the limits set forth in § 61.42(a) as demonstrated in an intruder assessment. An intruder assessment shall:

(1) Assume that an inadvertent intruder occupies the disposal site at any time during the compliance period after the period of institutional controls ends, and engages in normal activities including agriculture, dwelling construction, resource exploration or exploitation (e.g., well drilling), or other reasonably foreseeable pursuits that unknowingly expose the intruder to radiation from the waste.

(2) Identify adequate barriers to inadvertent intrusion that inhibit contact with the waste or limit exposure to radiation from the waste, and provide a basis for the time period over which barriers are effective.

(3) Account for uncertainties and variabilities.

Comments:

NRC is moving in the wrong direction with respect to assessing inadvertent intrusion. It's not

that inadvertent intrusion should not be evaluated—it must be—but rather that it be considered fundamentally different from other types of site occupation. Rather than develop or suggest particular scenarios as done in (1) above, and rather than develop a separate "intruder assessment," a site-specific performance assessment can cover all of this by evaluating likely future scenarios of who might occupy the site and what they might be doing. It must be recognized that agriculture, dwelling construction, and resource development are not universally normal activities. There could be disposal sites where none of these would be considered likely enough to survive a scoping analysis, let alone become part of a model. On the other hand, there are sites where all of these could happen, although with some likelihood that is probably less than 1 every year for in 10,000 years. There are still other activities that could lead to future waste releases or exposures, but would not of themselves be considered intrusive. The variation in likely activities between sites is part of what makes them different, and is important information for a site-specific performance assessment to incorporate.

Future humans who would intrude inadvertently into the waste should be considered just as any future member of the public would be considered, and with the same dose or risk metrics. However, the likelihood of any activity should also be considered, as the risk to future individuals is consolidated into a composite risk for the general population. There will be some individuals who experience greater exposures through their behavior or the activities of others, and there will be differences in how each individual responds to a given exposure. The language of risk to the general population and to any member of the public has been in Part 61 all along, but it has never been adequately spelled out. More of this discussion follows in comments to § 61.41 below.

Under our recommendation it would still be possible to distinguish between receptors that are deemed MOP or IHI, but only for the purpose of comparison to the appropriate performance objective. This would, however, assume that an inadvertent intruder should not be as protected as a MOP, which might not make sense when performing a proper risk (dose) assessment.

Proposed text:

§ 61.13(e) Analyses that assess how the disposal facility and site characteristics limit the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses shall only be required for land disposal facilities with long-lived waste that contains alpha-emitting radionuclides with average concentrations exceeding 10 nCi/g or radionuclides with average concentrations exceeding one tenth of the values listed in Table 1 of § 61.55, or if necessitated by site-specific factors including engineering design, operational practices, and site characteristics. The analyses must identify and describe the features of the design and site characteristics that will demonstrate that the performance objectives set forth in §§ 61.41(b) and 61.42(b) will be met.

Comments:

This appears to be asking for a "deep-time" analysis, meaning one that evaluates the fate of long-lived radionuclides and their progeny long after the compliance and performance periods have passed. That can be done, though as time progresses the uncertainties in performance-related processes should overwhelm the analysis (the only reason they do not is that all models project

out current societal conditions/knowledge into the indefinite future—it is not clear that this should be required beyond what might be termed the "foreseeable future"). But the fate of radionuclides and their progeny is not a "performance objective", which would imply a peak risk or dose to humans. If uncertainty in the future of physical processes is uncertain, uncertainties in demographics, behaviors, and even physiology of humans in the distant future are even greater. Long-term radiological impacts of the sort implied by the performance objectives presented in this part are difficult to estimate with any certainty, and are more difficult to defend.

§ 61.41 Protection of the general population from releases of radioactivity

Proposed text:

§ 61.41(a) Concentrations of radioactive material that may be released to the general environment in ground water, surface water, air, soil, plants, or animals must not result in an annual dose exceeding an equivalent of 0.25 milliSievert (25 millirems) to any member of the public within the compliance period. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable during the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(a).

(b) Reasonable effort should be made to maintain releases of radioactivity from a disposal facility to the general environment as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This is a welcome direct invocation of ALARA, which is appropriately applied to assessments of dose (or risk) to the general population. But while the term "general population" is used in the title, the text of this section uses the phrase "any member of the public". These are conceptually different. If we are to accept the phrase "any member of the public" at face value, then this implicitly means that the most vulnerable members of the public should be protected. This would include children, for example, who generally incur higher risks from exposure to radionuclides in the environment than do adults, due to both behavioral and physiological differences.

In performing a risk assessment of the general population, such members of the public should be considered, as should anyone else deemed to be exposed to radionuclides disposed at the site. This is where the so-called "inadvertent intruder" can be included as well, as a member of the public (i.e., as a potential receptor), rather than couched in some distinct assessment. The proper way to go about doing a population risk assessment is to consider who the receptors would be, what activities they would be pursuing, and what exposures they would encounter. Each receptor has its own likelihood of encountering radioactivity, for different amounts of time, in different exposure media, and with different physiological responses based on age, for example, as outlined in ICRP documents. This approach evaluates risks to each individual member of the public as well as the general population, and is required to satisfy the language of the title and text of this section.

Note this section also acknowledges a role for the compliance period. This means that zero discounting of risk or dose is allowed up to the compliance period, followed by complete discounting thereafter. We might suggest a smoother discounting function than this 0/1 step function. In general, a discounting function should be developed site-specifically to take into account the desires of the local potentially affected population. Discounting should not be construed negatively—it is simply a mechanism for deciding when to use available resources for further evaluation.

The same comments (see response to § 61.13(a)(5)) about using language that considers only part of the biotic spectrum applies here as well.

An additional problem is presented with the use of the term "effluents" in § 61.41(a). It seems to be assumed that the only mechanisms for the migration of radionuclides from the waste into the larger environment involves effluents, but this is not the case. Plants translocate chemicals (including radionuclides) within their tissues, though the fluids in plant tissues might be considered effluents. Burrowing animals move bulk soils, which are not effluents. Erosion can cause bulk movement of solid materials as well—again, not effluents. Atmospheric dispersion transports radionuclides from the ground surface that are not "effluents". Perhaps this language can be remedied by substituting something like "...effluents and other mechanisms of contaminant transport...". Alternatively, a sentence structure could be used that does not use the word "effluents" at all, as in § 61.41(b).

§ 61.42 Protection of inadvertent intruders

Proposed text:

§ 61.41(a) Design, operation, and closure of the land disposal facility must ensure protection of any inadvertent intruder into the disposal site who occupies the site or contacts the waste at any time after active institutional controls over the disposal site are removed. The annual dose must not exceed 5 milliSieverts (500 millirems) to any inadvertent intruder within the compliance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(b).

(b) Reasonable effort should be made to maintain exposures to any inadvertent intruder as low as reasonably achievable at any time during the performance period. Compliance with this paragraph must be demonstrated through analyses that meet the requirements specified in § 61.13(e).

Comments:

This language clarifies the allowable dose to an inadvertent intruder, but still we have members of the public who might be considered intruders who "fall through the cracks". Consider the case where an initial visitor to the site causes a disturbance to the engineered or natural barriers, and a later visitor is exposed to radioactivity. The initial visitor is not considered an intruder by the definition in this part, since s/he does not actually come into contact with the waste. Assume that this initial disturbance, however, compromises the integrity of the site in such a way that it causes radioactivity to be released after some time. A later visitor to the site, who would be a

member of the public because s/he would cause no disturbance of the site, could be exposed to that released radioactivity, or conceivably to the waste itself. How is this case to be considered given the definitions of "inadvertent intruder" and "member of the public" in this part? Here we have what seems to be an inadvertent intruder who is not exposed and a member of the public who could come into direct contact with the waste.

It would be far more straightforward to dispense with these definitions, and consider this receptor as someone who should be protected to the standard presented in § 61.41: with an annual dose not to exceed 0.25 mSv.

§ 61.58 Waste Acceptance

Proposed text:

§ 61.58(a)(1) Allowable activities and concentrations of specific radionuclides. Allowable activities and concentrations shall be developed from the technical analyses required by either § 61.13 for any land disposal facility or the waste classification requirements set forth in § 61.55 for a near-surface disposal facility.

Comments:

The only way to determine "allowable activities and concentrations of specific radionuclides" is to develop a site-specific performance assessment. Even with that support, a classic problem in developing waste acceptance criteria (WAC) is the non-unique solution of the sum-of-fractions. Further, with the incremental disposal of wastes, the remaining capacity for future wastes changes, thence changing the universe of wastes that can be accepted. Ideally, the criteria for the acceptance of waste would change with each disposal, reflecting the amount of remaining radiological capacity. This is not practical, however, as it is problematic for generators and operators both to have to contend with a "moving target" of WAC.

A more practical approach, then, is to have a sub-optimal working WAC that serves to ensure that the site does not accept more waste than its performance assessment would allow. In addition to meeting a standard WAC, candidate wastes that might not meet the WAC could also be considered on a case-by-case basis. Further, allowance should be made that a WAC be updated periodically, so that a site may be fully utilized. It would be better, then, to have as part of a license application, a defined methodology for developing a WAC, rather than the specific allowable activities and concentrations of radionuclides. The method may not change, but the allowable amounts will, and it would be beneficial to be able to make those changes without requiring license amendments. As long as the performance objectives for dose or risk are met, that should be sufficient.

Proposed text:

§ 61.58(b) Waste characterization. Each applicant shall provide, for Commission approval, acceptable methods for characterizing the waste for acceptance. The methods shall identify the characterization parameters and acceptable uncertainty in the characterization data. The following information, at a minimum, shall be required to characterize waste:

(1) Physical and chemical characteristics;
(2) Volume, including the waste and any stabilization or absorbent media;
(3) Weight of the container and contents;
(4) Identities, activities, and concentrations;
(5) Characterization date;
(6) Generating source; and
(7) Any other information needed to support the technical analyses set forth in § 61.13.

Comments:

This gets to the practical approach of defining a methodology. It is good to require "acceptable methods for characterizing waste for acceptance", and the data required are reasonable for supporting development of a WAC, in addition to a site-specific performance assessment. Since these data will change as disposal operations proceed, however, it is not sensible to require the data itself as part of a license application. It is reasonable to indicate that these data could be made available, and it is reasonable to indicate how the data would be used in developing a WAC.

Section 61.58 (b)(7) asks for "any other information", leading to two issues that we think need to be addressed in waste manifesting. Those are lower limits of detection (LLDs) and general reporting of concentrations that are greater than necessary, because they are often reported at a disposal site's waste concentration limit (part of a site's WAC). This over-estimation of inventory limits disposal capability. Perhaps some clarification is needed of the intent of (7).

Proposed text:

§ 61.58(c)(1-4) Waste certification. Each applicant shall provide, for Commission approval, a program to certify that waste meets the acceptance criteria prior to receipt at the disposal facility. ...

Comments:

We interpret this as asking for a program that will need to be statistically based in order to justify that the waste that is accepted is properly characterized for disposal. We are pleased that NRC encourages better characterization and specification of waste concentrations so that disposal can be more effectively managed. With improved characterization and manifesting, including appropriate reporting of LLDs, radioactive waste disposal resources can be better utilized.

This concludes comments from Neptune and Company, Inc. on the proposed revisions to 10 CFR 61.

From:	Gallagher, Carol
To:	RulemakingComments Resource
Subject:	Comment on Disposal of Unique Waste Streams
Date:	Tuesday, January 08, 2013 5:46:43 PM
Attachments:	NRC-2011-0012-DRAFT-0053.pdf

Attached for docketing is a comment from John Tauxe on the above noted document (77 FR 72997; December 7, 2012) that I received via the regulations.gov website on January 7, 2013.

Thanks,
Carol