U.S. Nuclear Regulatory Commission Standard Review Plan for Activities Related to U.S. Department of Energy Waste Determinations

A.H. Bradford, D.W. Esh, A.C. Ridge, A. Ryan Whited
U.S. Nuclear Regulatory Commission
Washington, DC, 20555
USA

ABSTRACT

Under the National Defense Authorization Act for Fiscal Year 2005 (NDAA), the U.S. Department of Energy (DOE) can determine that certain material resulting from the reprocessing of spent nuclear fuel is not high-level waste (HLW), and therefore does not need to be disposed of in a geologic repository in order to manage the risks that the waste poses. Section 3116 of the NDAA requires DOE to consult with the U.S. Nuclear Regulatory Commission (NRC) regarding DOE’s non-HLW determinations performed pursuant to the NDAA. The NDAA also requires the NRC to monitor DOE’s disposal actions to assess compliance with 10 CFR 61, Subpart C. The NDAA applies only to the States of Idaho and South Carolina; however, the NRC expects to perform similar technical reviews for waste determinations performed for waste at DOE’s Hanford site and West Valley Demonstration Project. Because the NRC expects that the number of waste determinations submitted for review will increase, the NRC decided to develop a Standard Review Plan (SRP) for waste determination reviews. The SRP provides technical guidance to NRC staff performing reviews of waste determinations and helps to ensure consistency among reviews. This paper provides an overview of the SRP and describes key aspects of how the NRC intends to conduct its reviews of waste determinations.

BACKGROUND

Some wastes resulting from the reprocessing of spent nuclear fuel must be treated and disposed of as high-level waste (HLW) in a geologic repository to manage the risks they pose to human health and safety. However, not all reprocessing wastes are equally hazardous. The U.S. Department of Energy (DOE) and U.S. Nuclear Regulatory Commission (NRC) recognize that some reprocessing wastes should be managed based on the risks they pose to human health and the environment, rather than based on their origins. DOE and NRC have used the terms “incidental waste”, “waste-incidental-to-reprocessing” (WIR) and “non-high-level waste” (non-HLW), to refer to reprocessing waste that does not pose the same risk to human health and the environment as HLW, does not need to be disposed of as HLW in order to manage the risks that it poses, and is not considered to be HLW.

The National Defense Authorization Act for Fiscal Year 2005 (NDAA) gives DOE the authority to determine that certain material resulting from the reprocessing of spent nuclear fuel is not HLW. The technical analyses DOE uses to evaluate whether reprocessing waste is incidental or HLW are summarized in waste determinations. Section 3116 of the NDAA requires DOE to consult with the Nuclear Regulatory Commission (NRC) regarding DOE’s non-HLW determinations performed pursuant to the NDAA. Although the NDAA applies only to the States of Idaho and South Carolina, similar waste determinations may be performed at DOE’s Hanford site and West Valley Demonstration Project. The NRC expects to perform similar technical reviews for waste determinations performed at those sites, although the NRC’s monitoring role is limited to sites covered by the NDAA. Because the NRC expects that the number of waste determinations submitted for review will increase, the NRC decided to develop a Standard Review Plan (SRP) for activities related to waste determinations [1]. The SRP is intended to provide guidance to NRC staff on how to conduct technical reviews of waste determinations and how to conduct monitoring activities pursuant to the NDAA, and to help ensure consistency among reviews performed by different reviewers.

Although the NRC has reviewed some of DOE’s previous incidental waste determinations, the role prescribed by the NDAA is new to the NRC. In its consultative role under the NDAA, NRC performs technical reviews of DOE’s waste determinations but does not have regulatory authority over DOE’s waste management activities. In addition to requiring that DOE consult with NRC regarding its waste determinations, the NDAA requires that NRC monitor waste disposal actions relevant to waste determinations performed for non-HLW in Idaho and South Carolina. Specifically, the NDAA requires the NRC to monitor the disposal actions to assess compliance with the performance objectives of 10 CFR 61 Subpart C, and to report any non-compliance to DOE, the affected State, and to Congress.

For DOE to determine that reprocessing waste is WIR, or non-HLW, the waste must meet certain criteria. Criteria applicable to waste disposed of at the Savannah River Site (SRS) and Idaho National Laboratory (INL) are provided in the NDAA. Criteria relevant to the Hanford site are provided in the Manual associated with DOE Order 435.1 (DOE M 435.1-1) [2] and criteria relevant to waste disposed of at the West Valley Demonstration Project are provided in the NRC's "Decommissioning Criteria for the West Valley Demonstration Project at the West Valley Site; Final Policy Statement" (West Valley Policy Statement) [3]. Although there are differences between the sets of criteria, in general, the criteria in DOE M 435.1-1 and the West Valley Policy Statement are similar to the criteria in the NDAA. The criteria of the NDAA are: 1) the waste does not need to be disposed of in a geologic repository; 2) the waste has had highly radioactive radionuclides removed to the maximum extent practical; and 3) the waste meets Class C concentration limits and will meet the performance objectives of 10 CFR 61 Subpart C, or the waste exceeds Class C concentration limits, will meet the performance objectives of 10 CFR 61 Subpart C, and will be disposed of pursuant to plans developed in consultation with the NRC. Differences among the criteria specified in DOE M 435.1-1, the West Valley Policy Statement, and the NDAA are discussed in detail in the SRP.

To consult with DOE on its waste determinations, the NRC conducts technical reviews to assess whether there is reasonable assurance that the applicable criteria will be met. Two important similarities among the sets of incidental waste criteria are that each requires an evaluation of the extent of radionuclide removal achieved before the waste is determined to be non-HLW, and each refers to the performance objectives of NRC's low-level waste (LLW) regulations (10 CFR 61 Subpart C). The performance objectives of 10 CFR 61 Subpart C include provisions for protection of the general population from releases of radioactivity, protection of individuals from inadvertent intrusion, protection of individuals during operations, and the stability of the disposal site after closure. The SRP provides specific guidance on assessing compliance with each performance objective.

DOE's ability to determine that not all reprocessing waste is HLW could have a significant effect on its ability to decontaminate and decommission its sites in a cost-effective and timely manner. DOE's waste determinations and NRC's reviews are watched closely by many stakeholders, including environmental groups, other Federal and State agencies, and the public. The NRC will use the SRP to provide an assessment of whether the disposition of the waste will be protective of public health and safety. This paper provides an overview of the SRP and describes key aspects of how the NRC intends to conduct its technical reviews of waste determinations.

USE OF THE STANDARD REVIEW PLAN

The SRP is intended to provide guidance to NRC staff reviewing waste determinations relevant to waste at SRS, INL, Hanford, and West Valley. The review plan describes specific areas that the staff should review to determine whether there is reasonable assurance that the appropriate criteria can be met. The plan also provides a discussion of the requirements of each set of review criteria, information about the NRC's role in the waste determination process, guidance on review documentation, and guidance for staff engaged in monitoring activities under the NDAA. As a guidance document, the SRP does not establish regulatory requirements for NRC or DOE.

Technical guidance for most topics discussed in the SRP is divided into review areas and review procedures. In general, the review areas describe the scope of the review and provide a brief discussion of the specific types of technical information and analyses that should be reviewed. Because the SRP may be used in reviews of waste determinations relevant to many different types of waste, the lists of review areas are not exhaustive and may be supplemented as appropriate. The review procedures describe review techniques. Specific review procedures are provided for each technical topic. In addition, the SRP provides general review procedures that are applicable to many parts of a review. For each review procedure, the reviewer is expected to determine whether the results of the procedure support the conclusions in the waste determination, or to determine that there is an adequate technical basis to conclude that the specific topic does not need to be addressed.

The SRP emphasizes that reviews of waste determinations should be performance-based and risk-informed. A performance-based review is focused on the predicted performance of a facility, rather than prescriptive review criteria. Thus, the review of a particular waste determination may require review procedures that are not outlined in the SRP, and all of the review procedures described in the SRP may not be applicable to each review. A risk-informed review is focused on those aspects most important to health and safety. Therefore, the staff is expected to emphasize the review procedures and review areas that are related to the aspects of the disposal system that are expected to have the most significant effect on the dose to potential receptors.

The SRP provides guidance on reviewing compliance with each incidental waste criterion. Typically, the largest technical challenge in a review is determining whether the waste will meet the performance objectives of 10 CFR 61 Subpart C. Because demonstrating that the performance objectives can be met typically requires complex technical analyses, the SRP provides guidance regarding the demonstration of compliance with each performance objective. In general, the technical approaches described in the SRP are consistent with the approaches recommended in NRC's LLW guidance (e.g., NUREG-1573 [4]).

NDAA CRITERION ONE

The first criterion of the NDAA is that the waste does not require permanent isolation in a deep geologic repository for spent fuel or high-level radioactive waste. No similar criterion is included in DOE Order 435.1 or in the West Valley Policy Statement. The purpose of this criterion is to allow for the consideration that waste may require disposal in a geologic repository even though the two other criteria of the NDAA may be met. Consideration could be given to those circumstances under which geologic disposal is warranted in order to protect public health and safety and the environment; for example, unique radiological characteristics of waste or non-proliferation concerns for particular types of material. If there are no unique reasons that the waste requires geologic disposal, NRC expects there will be reasonable assurance that this criterion can be met if the two other criteria of the NDAA can be met.

RADIONUCLIDE REMOVAL

Each set of incidental waste criteria includes a requirement related to removal of radionuclides from the waste prior to disposal. The second NDAA criterion requires that highly radioactive radionuclides be removed from the waste to the maximum extent practical. The West Valley Policy Statement and DOE M 435.1-1 include a requirement that key radionuclides be removed from the waste to the maximum extent technically and economically practical. As discussed in the SRP, the NRC staff interprets the terms "key radionuclides" and "highly radioactive radionuclides" to refer to those radionuclides that contribute most significantly to risk to the public, workers, and the environment. The NRC staff interprets removal to the "maximum extent practical" to be similar to removal to the "maximum extent technically and economically practical," but concludes that removal to the "maximum extent practical" allows for somewhat broader considerations. For example, the NRC staff expects that evaluation of removal to the maximum extent practical may include evaluation of impacts on DOE's schedules or programmatic goals.

The SRP outlines two main aspects of the review of radionuclide removal. The first is a review of DOE's selection of radionuclide removal technologies. In this part of the review, reviewers compare the expected performance of radionuclide removal technologies selected by DOE with the expected performance of alternate radionuclide removal technologies, including technologies being used or developed at other DOE sites. In addition, the SRP directs the reviewer to consider the process that DOE used to select radionuclide removal technologies, and to ensure that an appropriate range of technologies has been considered. The goal of this part of the review is to determine whether DOE selected the most appropriate technology or combination of radionuclide removal technologies.

The second part of the review is a comparison of the costs and benefits expected from additional radionuclide removal. The goal of this part of the review is to determine whether radionuclide removal beyond what DOE has completed or plans to complete would be practical. The NRC staff expects practicality typically would be determined by evaluating the potential risk that could be averted by achieving additional removal of radionuclides in relation to the financial costs and any risks that might be incurred by continuing radionuclide removal activities. As previously discussed, for reviews performed pursuant to the NDAA, the NRC expects that a broad range of issues might be considered when evaluating practicality. However, in most cases, those broader considerations should be evaluated in a quantitative manner; for example, schedule delays could be quantified by estimating the monetary cost or risks associated with delaying waste processing.

Instead of proposing a fixed cost-benefit standard to assess practicality, the SRP directs NRC reviewers to compare the relative costs and benefits of DOE's proposed radionuclide removal activities to the costs and benefits of other similar DOE activities. Thus, if DOE indicates that completing additional radionuclide removal activities would not be practical, the reviewer would expect DOE to demonstrate that the costs and risks associated with additional radionuclide removal would be greater than the costs and risks associated with other DOE activities that accomplish a similar amount of risk reduction. In general, the NRC staff expects costs and benefits to be quantified in terms of risks to members of the public, risks to workers, and financial costs.

CONCENTRATION LIMITS

Both the NDAA and DOE M 435.1-1 refer to NRC's LLW classification system, while the West Valley Policy Statement does not. The NDAA specifies that if the waste being evaluated exceeds the concentration limits for Class C waste, as given in 10 CFR 61.55, DOE is required to consult with NRC on the development of its disposal plans for that waste. NRC's LLW regulations indicate that, although waste with radionuclide concentrations above the concentration limits for Class C LLW as defined in 10 CFR 61.55 is generally unacceptable for near-surface disposal, it may be acceptable for near-surface disposal with special processing or design. In addition the regulations indicate that the form and disposal methods for waste that exceeds Class C limits must be different, and in general more stringent, than those specified for Class C waste (10 CFR 61.55(a)(2)(iv)). For this reason, the SRP indicates that to provide the additional consultation required by Criterion 3B if waste exceeds Class C limits, the reviewer will evaluate how the proposed disposal methods are more stringent than those that would be proposed for Class C waste.

Because many wastes relevant to waste determinations are expected to be heterogeneous (e.g., residual waste in a HLW tank), the most significant technical challenge in determining waste classification is determining the appropriate volume or mass of waste over which concentrations should be averaged. The concentration averaging guidance provided in the SRP is based on NRC's branch technical position on concentration averaging and encapsulation [5]. The purpose of the guidance in the SRP is not to replace the guidance in the branch technical position, but to provide specific examples of the application of the principles of the branch technical position to cases more specific to incidental waste. Acceptable methods for concentration averaging for the purposes of waste classification for waste determinations are based on the following fundamental principles introduced in the branch technical position:

- Measures are not to be undertaken to average extreme quantities of uncontaminated materials with residual contamination solely for the purpose of waste classification;

- Mixtures of residual waste and materials can use a volume or mass-based average concentration if it can be demonstrated that the mixture is reasonably well-mixed; and

- Credit can be taken for stabilizing materials added for the purpose of immobilizing the waste (not for stabilizing the contaminated structure) even if it cannot be demonstrated that the waste and stabilizing materials are reasonably well-mixed, when the radionuclide concentrations are likely to approach uniformity in the context of applicable intruder scenarios.

As indicated by the first principle above, extreme measures should not be taken when performing concentration averaging to determine waste classification. Extreme measures include: 1) averaging assumptions that are inconsistent with the physical distribution of radionuclides over the averaging volume or mass, 2) deliberate blending of lower concentration waste streams with high activity waste streams to achieve waste classification objectives, or 3) averaging over stabilizing material volume or masses that are not needed to stabilize the waste to satisfy the stability requirements of 10 CFR 61.56 or are not homogeneous from the context of the intruder scenarios.

The SRP presents examples of cases in which waste is fairly homogeneous as well as cases in which heterogeneous waste is stabilized in place. In the simplest example, liquid waste is mixed with dry grout to form a homogeneous cementitious waste form. In this case, the determination of waste classification is straightforward because the concentrations of radionuclides do not vary significantly throughout the wasteform. In a more complex example, a layer of waste composed of liquids and dispersible solids is stabilized with a layer of chemically reducing grout. In this case, the concentration of the waste may be averaged over the layer of reducing grout required to stabilize the waste, but the volume over which the concentrations are averaged should not include any additional grout used to stabilize the tank itself. The SRP indicates that the concentration of radionuclides in stabilized waste should generally be within a factor of ten of the concentrations in unstabilized waste. A factor of ten is considered appropriate because wastes are expected to be stabilized with cementitious material, and most cementitious wasteforms can stabilize waste at a ten percent mass waste loading.

The SRP also indicates that concentrations may be averaged over a volume of stabilizing material even when the waste is not expected to be mixed within the stabilizing material, if the concentrations approach uniformity with respect to intruder scenarios. For example, a thin layer of waste on the side of a tank wall may be relatively immobile and therefore may not be mixed with grout that is poured into a tank to stabilize the waste. In this case, it would be appropriate to average the concentration of the thin layer of waste over the thickness of the wall to which it is adhered as well as over a volume of the stabilizing grout equivalent to the volume required to achieve a ten percent mass loading of the waste in the grout. In this case, the ratio of the concentrations of radionuclides in the unstabilized waste to the concentrations in the stabilized waste would be approximately a factor of twenty instead of a factor of ten. However, the averaging is acceptable because the concentration would be likely to be homogeneous in the context of an intruder scenario. For an intruder to contact the waste, the intruder would need to drill a well, encounter the tank wall, and spread the drill cuttings on the land surface. In the context of this scenario, the intruder would be likely to exhume a quantity of stabilizing material that would dilute the thin layer of waste on the tank wall by at least a factor of twenty.

As discussed in the branch technical position, regardless of the averaging that is performed for waste classification purposes, the actual distribution of the waste must be considered in evaluating compliance with the performance objectives of 10 CFR Part 61, Subpart C. To illustrate this point, the SRP describes an example in which reducing grout is added to a waste heel in a HLW tank. An intruder scenario is evaluated in which a well-driller places a well through the disposal system. In this case, the intruder is exposed to waste that is exhumed with the drill cuttings. The average concentration of the waste used in assessing the exposure of a hypothetical inadvertent intruder should be calculated by assuming mixing over the volume of well cuttings exhumed because the cuttings are expected to be well-mixed when spread on the land surface. This average concentration is applicable only to the evaluation of compliance with the performance objective for the protection of an inadvertent intruder (10 CFR 61.42) and not to the determination of waste classification. Although the SRP indicates that concentrations used in performance assessments or inadvertent intruder analyses should reflect actual expected concentrations rather than concentrations used for waste classification, the SRP also indicates that conservative assumptions are appropriate. Thus, concentrations other that the expected concentration may be used in performance assessments or inadvertent intruder analyses if it can be shown that the alternate concentrations result in larger predicted doses.

PERFORMANCE OBJECTIVES OF 10 CFR 61 SUBPART C

Each set of incidental waste criteria references NRC's performance objectives for LLW, 10 CFR 61 Subpart C. Criteria 3A and 3B of the NDAA require that non-HLW meet NRC's performance objectives for LLW, while DOE M 435.1-1 and the West Valley Policy Statement require that waste meet either NRC's performance objectives for LLW or comparable performance objectives. The general requirement of 10 CFR 61 Subpart C requires that land disposal facilities must be sited, designed, operated, closed, and controlled after closure so that reasonable assurance exists that exposures to humans are within the limits established in the performance objectives in 10 CFR 61.41 through 61.44. The SRP directs reviewers to assess compliance with 10 CFR 61.40 by assessing compliance with 10 CFR 61.41 through 61.44.

Although the performance objectives of Subpart C are the only part of NRC's LLW regulations that are referenced explicitly in any set of incidental waste criteria, the SRP references other parts of the regulations in 10 CFR Part 61 to provide information and guidance to reviewers. For example, while none of the incidental waste criteria require compliance with the siting requirements of 10 CFR 61.50, the SRP references the siting requirements because they alert reviewers to potentially important exposure pathways. Although the SRP references other parts of the regulation, reviewers evaluate compliance only with the performance objectives of Subpart C (or other comparable performance objectives, for waste determinations relevant to DOE's Hanford site or West Valley).

Application of the Performance Objectives to Waste Determinations

Although the SRP is intended to provide specific guidance to NRC staff reviewing waste determinations, the guidance is, in general, based on and consistent with NRC's existing LLW guidance. For example, guidance provided in the SRP regarding appropriate locations of hypothetical receptors to demonstrate compliance with 10 CFR 61.41 and 10 CFR 61.42 is based on the concepts of a disposal site and disposal units that are established in 10 CFR 61.2 and illustrated in the final Environmental Impact Statement (EIS) for 10 CFR 61 [6]. As illustrated in the EIS, a disposal site includes a buffer zone around a disposal area, where the disposal area circumscribes the disposal units. An appropriate buffer zone is expected to extend approximately 100 m (330 ft) from the disposal area. In the case of a tank farm, the tanks are expected to be regarded as disposal units. Thus an appropriate buffer zone is expected to extend 100 m (330 ft), or a similar distance that is supported by technical justification, from the line circumscribing the tanks in a single tank farm.

In evaluating compliance with 10 CFR 61.41 and 10 CFR 61.42, it is assumed that members of the public (including inadvertent intruders) will remain outside the larger DOE site until active institutional controls have ceased. To demonstrate compliance with 10 CFR 61.41, a hypothetical receptor is assumed to engage in residential, agricultural, or other activities at the point of maximum exposure outside of the boundary of the disposal site (i.e., outside the buffer zone) after active institutional controls have ceased. In some instances, such as at sites with a complex hydrogeologic system or where there are multiple sources, the point of maximum exposure may be farther from the disposal area than the edge of the buffer zone. A receptor engaging in activities on the disposal site, rather than outside the buffer zone, after institutional controls have ceased is regarded as an inadvertent intruder for demonstrating compliance with 10 CFR 61.42.

The regulations in 10 CFR 61.59(b) specify that institutional controls may not be relied upon for more than 100 years after transfer of control of the disposal site to the owner. As discussed in the SRP, the NRC staff concludes that this restriction should be applied to analyses supporting waste determinations. According to the provisions of 10 CFR 61.59(a), commercial LLW sites must be owned by the State or Federal government after site closure; therefore, the restriction seems equally applicable to incidental waste disposal sites owned by the Federal government as it does to commercial LLW sites. Essentially, the requirement that institutional controls not be relied upon for more than 100 years is based on the regulatory philosophy that the engineered and natural system should afford protection to the public, without total reliance on institutional control of the site, because of the relatively large uncertainty associated with predicting the persistence of societal systems for very long times (i.e., hundreds or thousands of years).

At the time of development of 10 CFR Part 61, it was envisioned that LLW in a disposal facility would decay, in a maximum of 500 years, to activity levels that would not pose a significant risk to an inadvertent intruder and that there would not be significant quantities of long-lived isotopes which would pose unacceptable long-term risks to the public from releases from the facility. NRC considered longer periods of institutional control in the draft EIS for 10 CFR Part 61[7]. Assumptions about the persistence of institutional controls in the international community were considered and a series of public meetings were conducted to solicit input from stakeholders. The consensus among the stakeholders was that it is not appropriate to assume institutional controls will last for more than a few hundred years. Material that does require institutional control for much longer than 100 years to demonstrate compliance with the performance objectives would generally be determined to not be suitable for near surface disposal as LLW.

Although 10 CFR 61 does not specify what analysis period should be used to demonstrate compliance, NRC's LLW guidance (NUREG-1573) indicates that, in general, a performance period of 10,000 years is considered to be an appropriate performance period for evaluating compliance with the performance objectives of 10 CFR Subpart C. An analysis period of 10,000 years is believed to be sufficient to capture the peak dose from long-lived, mobile contaminants, and to facilitate evaluation of the natural system instead of encouraging over-reliance on the engineered barriers. Because some types of incidental waste may have higher concentrations of long-lived radionuclides than typical commercial LLW, the SRP advises that doses that may occur more than 10,000 years after facility should be considered as part of a risk-informed decision; however, the SRP does not recommend that doses that occur more than 10,000 years after facility closure be considered as a basis for evaluating compliance with the performance objectives of 10 CFR Part 61, Subpart C.

PERFORMANCE OBJECTIVE FOR THE PROTECTION OF THE GENERAL POPULATION FROM RADIONUCLIDE RELEASE (10 CFR 61.41)

To demonstrate compliance with 10 CFR 61.41, the dose limit is compared to the dose to a hypothetical receptor who is assumed to engage in residential, agricultural, or other activities at the point of maximum exposure outside of the disposal site after active institutional controls have ceased. The performance objective for protection of the general population from releases of radioactivity (10 CFR 61.41) requires that concentrations of radioactive material which may be released to the general environment in groundwater, surface water, air, soil, plants, or animals will not result in an annual dose to a member of the public that is greater than 0.25 mSv (25 mrem), and will be maintained as low as is reasonably achievable (ALARA). Although 10 CFR 61.41 requires that materials released to the general environment will not result in an annual dose exceeding an equivalent of 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public, the NRC staff uses an exposure limit of 0.25 mSv (25 mrem) total effective dose equivalent (TEDE) in making this assessment [8].

The dose limit provided in 10 CFR 61.41 (0.25 mSv/yr [25 mrem/yr]) applies to the cumulative impacts from all of the LLW disposal units that could contribute to the dose to a hypothetical receptor. Thus, if there is a point on the site where a hypothetical receptor could be exposed to waste from all of the tanks in a tank farm, the limit would apply to the cumulative dose from all tanks in the farm, even if the tanks were addressed in several different waste determinations. To account for cumulative doses, the SRP directs reviewers to consider estimated doses in previous waste determinations for different sources that could contribute to receptor doses. After all waste determinations for a site are complete, a demonstration of compliance with 10 CFR 61.41 will be based on the maximum dose to a hypothetical receptor from all disposal units subject to waste determinations.

In addition to demonstrating that doses will remain below the dose limit, 10 CFR 61.41 includes a requirement that doses will be maintained ALARA. The SRP advises that, in general, the conclusion that proposed waste management activities will result in the removal of highly radioactive radionuclides to the maximum extent practical supports the conclusion that releases of radioactivity in effluents from the disposal site will be maintained ALARA. In addition, because steps taken to stabilize waste also are expected to limit radionuclide release from the disposal facility, and, therefore, reduce potential doses to members of the public, the SRP also advises reviewers to evaluate DOE's description of actions taken to stabilize the waste to minimize the release of radionuclides from the disposal facility (e.g., efforts to optimize solidification of liquid wastes, or efforts to optimize mixing or encapsulation of residual tank waste with grout). In keeping with the general guidance that reviews should be risk-informed, the SRP indicates that the review should be focused on the dominant pathways of radionuclide release from the disposal facility and the factors causing the most uncertainty in release rates, as determined in DOE's performance assessment and independent analyses.

Performance Assessment Review Approach

Compliance with the performance objective of protection of the general population from releases of radioactivity (10 CFR 61.41) typically is demonstrated with a performance assessment. A performance assessment is a quantitative evaluation of potential releases into the environment and the resulting doses to a hypothetical receptor. A performance assessment may be performed with a single integrated model or a set of individual models that are manually integrated to predict doses to potential receptors. The SRP emphasizes that the appropriate level of complexity of a model depends on both the level of realism necessary to demonstrate compliance and on the quality of information available to support the model. A detailed representation may not be justified if the site or facility components are not characterized well enough to provide a technical basis for selecting between various conceptual models of long-term behavior or to provide the information a complex model might require to establish appropriate values of initial or boundary conditions.

The SRP provides specific technical guidance on reviewing scenario selection, climate and infiltration, degradation and performance of engineered barriers, radionuclide release from wasteforms, radionuclide migration in the geosphere, and the calculation of doses to potential receptors. In addition, technical guidance also is provided on reviewing computational models and computer codes, methods to interpret intermediate and final model results, and evaluating the results of sensitivity and uncertainty analyses. To facilitate risk-informed reviews, the SRP directs reviewers to use the results of sensitivity and uncertainty analyses to help to focus reviews on those parameters and processes most important to meeting the performance objectives. Because DOE may demonstrate compliance with the performance objectives with either deterministic or probabilistic analyses, the SRP provides guidance on evaluating the effects of uncertainty using both probabilistic and deterministic analyses.

In addition to providing specific guidance on reviewing various parts of a performance assessment model, the SRP provides a set of general technical review procedures that an NRC reviewer is expected to apply to the review of all aspects of a performance assessment. The general review procedures are summarized here because they illustrate the approach the NRC will take in reviewing performance assessments supporting waste determinations. Furthermore, many of the specific technical review procedures described in sections of the SRP devoted to the review of particular technical topics (e.g., infiltration, barrier degradation, or radionuclide release) are implementations of a general review procedure. The general review procedures address the system description, data sufficiency, data uncertainty, model uncertainty, and model support.

The general review procedures related to system description direct the reviewer to compare DOE's description of the waste disposal system with the representation of its major features and processes in the performance assessment. In particular, reviewers will ensure that significant potential pathways for radionuclide release, transport, and uptake by potential receptors have been represented in the performance assessment or that a technical justification has been provided for why the pathways can be excluded. For example, common exposure pathways include ingestion, inhalation, and external exposures. Transport pathways may be excluded from the performance analysis if it can be demonstrated that there is limited potential for radionuclides to be released into a particular pathway, or that the pathway is not viable (e.g., water is not potable). The SRP emphasizes that, in selecting exposure scenarios and exposure pathways, the reviewer should consider site-specific information, and ensure that the exposure pathways included in the analysis are consistent with regional practices.

The system description review procedures also include procedures intended to ensure that the modeled representations of significant exposure pathways do not underestimate potential radionuclide release and dose to a hypothetical receptor. Thus, if simplified analyses are used, the reviewer will ensure that a more realistic representation of the disposal system would decrease rather than increase the predicted dose. In addition, the reviewer must verify that the representations of various parts of the physical disposal system (e.g., infiltration, engineered barriers, radionuclide release, and radionuclide transport in unsaturated soil, aquifers, surface waters, and air) are consistent with each other and with the description of the disposal system. For example, if the hydraulic conductivity of an infiltration barrier is expected to increase over time, the reviewer would ensure that the increase in hydraulic conductivity is represented in the infiltration submodel and that any increased infiltration is represented in the amount of water represented in the radionuclide release submodel.

The review methods related to data sufficiency focus on ensuring that model assumptions and parameters are supported by data, that the data used are appropriate, and that parameter values and model assumptions are consistent with site and disposal system conditions. For key parameters to have an adequate technical justification, the disposal system must be characterized well enough to support the level of complexity of the performance assessment. For example, to have an adequate technical basis for modeling the long-term performance of engineered barriers, there must be enough appropriate data to justify initial conditions used to represent barrier performance as well as a model of barrier degradation. If a simple bounding calculation can demonstrate compliance, relatively little site-specific data may be needed to support the performance assessment. However, in more complex cases many different sources of data may be needed to support an incidental waste performance assessment. Types of data that could be used to support a performance assessment include site-specific data (e.g., laboratory measurements and full-scale measurements or experiments), data from analogous sites, data from generic sources, output from detailed process-level models, and expert judgment. As described in the SRP, the reviewer is expected to use the results of sensitivity and uncertainty analyses to evaluate data sufficiency by determining whether parameter values or alternate modeling assumptions that are consistent with the uncertainty in the data could lead to unacceptable results.

To assess whether the data are appropriate, the reviewer will evaluate whether data used to support parameter values or modeling assumptions are applicable to the conditions expected in the environmental system. For example, if laboratory experiments were used measure leach rates, the reviewer would evaluate whether the chemical conditions used in the experiment were the same as the chemical conditions expected to exist in the disposal facility, or, if not, whether the impacts of any differences were accounted for in the performance assessment. Another key aspect of the evaluation of the appropriateness of data addressed in the SRP is verification that appropriate quality assurance procedures have been used. The SRP emphasizes that the degree of technical justification provided to support a parameter value or modeling assumption should be commensurate with the effect of the value or assumption has on the dose predictions.

Review procedures related to data uncertainty are used to ensure that DOE has captured the variability in data and provided an assessment of uncertainty due to incomplete knowledge of the natural system, engineered system, or inventory. The SRP advises reviewers to consider whether both spatial variability, such as variability in soil characteristics, and changes in time, such as barrier degradation, have been represented in the performance assessment or that the effects have been bounded. In general, in a probabilistic assessment, the effects of uncertainty and variability in parameter values are represented by using probabilistic distributions of parameter values instead of single values. If DOE uses a probabilistic performance assessment, the primary tasks of the reviewer are to determine whether the parameter distributions and any bounding values used are appropriate, and whether there is adequate technical basis to conclude that the parameter ranges support the treatment of uncertainty and variability of the parameters.

In a deterministic analysis, data uncertainty can be examined by the use of sensitivity analyses and bounded by using conservative values. If DOE uses a deterministic analysis for part or all of its performance assessment, the reviewer will evaluate the technical bases for parameter values, assumed ranges used in sensitivity analyses to characterize data uncertainty, and bounding values used in conceptual and process models. One of the challenges of evaluating deterministic analyses discussed in the SRP is to determine whether values that appear to be conservative are conservative in all ranges of the system behavior. For example, increasing the modeled hydraulic conductivity of saturated zone aquifers to address uncertainty may be conservative with respect to contaminant travel time but may be non-conservative with respect to dose as a result of increased dilution of contaminant fluxes entering the saturated zone from the unsaturated zone.

Review methods related to model uncertainty are intended to ensure that DOE has considered alternate ways of representing processes taking place in the disposal system (e.g., barrier degradation or radionuclide release), and to ensure that alternative models that are consistent with available supporting information will not result in greater predicted doses. Evaluating the treatment of model uncertainty is a particularly important aspect of reviewing performance assessments that support waste determinations because the modeled systems typically are complex and must perform as designed for thousands of years. Because the disposal systems typically are complex and may be poorly characterized, more than one mathematical representation of the evolution of the system may be consistent with the available data. Furthermore, because of the long time periods of interest, models used to support waste determinations generally cannot be verified directly.

The SRP advises reviewers to evaluate model uncertainty by considering reasonable ranges in conditions and processes to test the robustness of the facility, by using distributions of parameters to represent the likely ranges in conditions or processes, or by bounding the effects of model uncertainty by using conservative assumptions. Although some model uncertainty may be parameterized, the reviewer must determine whether the results of a plausible alternative model of a process could yield results that were not considered in the performance assessment. For example, if a sorption model of radionuclide release is used, in addition to evaluating the technical justification for the values of sorption coefficients used, the reviewer also must determine whether alternative models of radionuclide release, such a solubility-limited release, could result in greater predicted doses than the sorption model. Ideally, model uncertainty is minimized by developing as much model support as practical.

Review procedures related to model support are used to ensure that performance assessment model results can be supported by comparison to independent data. In general, the reviewer should expect to evaluate multiple lines of evidence supporting each key aspect of the performance assessment model. Multiple lines of evidence may include site characterization and design data, results of process-level modeling, laboratory testing, field measurements, analogs, and formal independent peer review. For example, selection of a model of wasteform degradation may be supported by laboratory tests that indicate that a particular degradation mechanism is expected to dominate degradation under site conditions, as well as by observations that similar cementitious materials at the disposal site show signs of the same type of degradation. In keeping with the guidance that reviews of waste determinations should be risk-informed, the SRP indicates that the amount of support needed for any aspect of a performance assessment model depends on the impact that the submodel or modeling assumption has on the predicted dose to a hypothetical receptor.

Reviewers also are expected to evaluate model support with independent analyses. Specifically, the SRP directs reviewers to compare performance assessment results with process model results, with any available observations from the site, or with the behavior of analogous systems. For example, if information is available about leaks or spills at a site, the reviewer is expected to compare performance assessment predictions of radionuclide transport with inferences about radionuclide transport that can be developed from site-specific data. Similarly, the SRP directs reviewers to use available information about the site to perform simplified calculations of processes represented in the performance assessment and to compare the results to intermediate outputs of the performance assessment model. For example, the reviewer may estimate the ground water travel time of select radionuclides using information about the hydraulic gradient, hydraulic conductivity, porosity, density, and radionuclide distribution coefficients and compare the calculated travel times to the to the travel times generated by the performance assessment model. Radionuclide travel times may be determined in different ways that depend on the performance assessment model implementation. For example, in some cases, radionuclide travel times may be determined by comparing when peak fluxes are released from the source and when they arrive at a modeled boundary (e.g., between the unsaturated and saturated subsurface).

PERFORMANCE OBJECTIVE FOR THE PROTECTION OF INDIVIDUALS FROM INADVERTENT INTRUSION (10 CFR 61.42)

NRC's LLW regulations (10 CFR 61.2) define an inadvertent intruder as a person who might occupy a disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, or other pursuits in which the person might be unknowingly exposed to radiation from the waste. The performance objective for protection of individuals from inadvertent intrusion (10 CFR 61.42) requires that the design, operation, and closure of the land disposal facility will ensure protection of any individual inadvertently intruding into the disposal site and occupying the site, or contacting the waste at any time after the end of active institutional controls over the disposal site. The performance objective does not provide numerical dose criteria for protection of an inadvertent intruder. However, NRC typically applies a whole body-dose equivalent limit of 5 mSv/yr (500 mrem/yr), as described in the draft EIS for 10 CFR Part 61 [7], to assess compliance with 10 CFR 61.42.

Review Approach

Compliance with the performance objective for protection of individuals from inadvertent intrusion typically is demonstrated with fairly simple calculations that may not be regarded as a full performance assessment. Evaluation of hypothetical intrusion scenarios typically focuses on evaluating the behavior of the intruder, timing of the intrusion, and the exposure pathways simulated in the analysis. The reviewer typically assesses assumptions and parameters used in developing the intrusion analysis, characteristics of the intrusion event, how uncertainties are considered in the analysis, and resulting conditional doses for each intruder scenario.

The SRP emphasizes that the reviewer should assess whether exposure scenarios evaluated in the intruder analysis are consistent with past, current, and projected regional practices. For example, at a site with shallow water sources and low-strength surface geologic materials, it may be reasonable to exclude exposure pathways related to well drilling because local drilling companies may not typically be equipped to drill through buried, high-strength engineered materials such as steel or grout. However, at a site with high-strength geologic materials (e.g., basalt) and deep water sources, drilling companies may be more likely to drill through an underground engineered structure inadvertently. The reviewer also must evaluate consistency with the performance assessment. For example, the reviewer typically will confirm that the same radionuclide inventories are used for both the performance assessment and the intruder analysis.

The timing of intrusion often has a significant effect on the peak predicted dose to a hypothetical intruder. As previously discussed, active institutional controls are limited to 100 years or less, but DOE may develop passive systems to protect from inadvertent intrusion. Thus a key part of the review of inadvertent intruder analyses is the review of any intruder protection system proposed by DOE (e.g., caps, rock layers, or burial of waste at depths sufficient to reduce the potential for inadvertent intrusion). As discussed in NUREG-1573, service lives for engineered barriers that are on the order of a few hundred years are considered credible, if justified by adequate technical analyses and data.

In addition to reviewing the technical justification for the expected barrier lifetime, the reviewer will assess how the features of the engineered barriers and projected service lifetimes are incorporated in the intruder analysis. For example, depth to waste is an important consideration in defining intruder scenarios, because some scenarios may not be credible if the waste is generally inaccessible. In reviewing potential exposure pathways, the reviewer typically will ensure that wasteform and barrier degradation were considered. For example, in some cases it may be appropriate to exclude the possibility of exposure due to drilling for the first 1000 or 2000 years after the end of active institutional controls because of intruder barriers or wasteform characteristics, but drilling may become more plausible as the wasteform or barriers degrade. After evaluating the amount of time that intruder barriers may limit access to the waste, the reviewer must verify that the time of intrusion assumed in the analysis produces the maximum dose. For example, an intrusion event at 100 years may produce the maximum dose from short-lived fission products but the maximum dose from the daughters of long-lived isotopes may occur long after 1000 years.

The reviewer also will verify that the probability of an intruder scenario occurring (e.g., the probability that an intruder will drill into a disposal unit) is not used to modify the predicted dose to a hypothetical intruder. Instead, conditional doses (i.e., doses based on the assumption that the selected intruder scenario does occur) should be used to demonstrate compliance. Conditional doses are appropriate because the lower probability of an intruder scenario is already accounted for in the dose limit used to demonstrate compliance with 10 CFR 61.42, which is twenty times greater than the dose limit used to demonstrate compliance in the nominal case (10 CFR 61.41).

Intruder Analysis Exposure Scenarios

Because of the large uncertainty inherent in predicting what activities humans may engage in at a disposal site in the far future, scenarios considered in intruder analyses are designed to bound the exposure of a hypothetical intruder to radioactivity while avoiding speculation about future human activities. The regulations in 10 CFR 61.42 do not specify a particular scenario to be used to demonstrate compliance. Instead, in intruder scenarios, it is assumed that after active institutional controls have ceased, land use at the disposal facility will be consistent with current regional practices or regional practices of the recent past (e.g., during the last few decades). In general, guidance about intruder scenarios provided in the SRP is consistent with guidance provided in the draft EIS for 10 CFR 61 [7] and NUREG/CRB4370 [9].

Scenarios evaluated to demonstrate compliance with 10 CFR 61.42 may include scenarios in which an intruder lives, farms, constructs a home or other buildings, drills a well or wells, or engages in recreational activities at a site after the end of the institutional control period. In addition, other, less common scenarios may be relevant at particular sites. Typically, the reviewer will assess the location of the intruder relative to the waste disposal system, the behavior attributed to the intruder (e.g., the amount of time spent at the site), relevant exposure pathways, and the timing of the intrusion. The relevance of exposure pathways, like the relevance of scenarios, must be evaluated in the context of expected site conditions. The reviewer must evaluate the dose pathways assumed for any particular scenario (e.g., direct exposure, inhalation, ingestion of drinking water, ingestion of plants or animals grown on the site, or inadvertent ingestion of soil from the site), and the parameters and calculations used to estimate intruder doses. Additional potential exposure pathways will depend on the intruder scenario. For example, when evaluating an agricultural scenario, the reviewer is expected to examine the extent to which the intruder analysis accounts for the effects of ground-disturbing activities by the farmer (e.g., plowing, spreading drill cuttings).

The intruders= activities are presumed to take place directly on top of the disposal area. For example, in the intruder-resident scenario, an intruder is assumed to be exposed to waste by constructing a house and living on the waste disposal area. Similarly, in an intruder-agriculture scenario, it is assumed that after the end of active institutional controls, a farmer lives on, and consumes food crops grown and animals raised on the disposal area. In the intruder-driller scenario, it is assumed that after the end of active institutional controls, a well is drilled into the waste disposal system. In a drilling scenario, an acute intruder is assumed to be the person or persons who install the well and are exposed to drill cuttings during well installation. Exposure of a resident or farmer to drill cuttings left on the land surface after the installation of a well would be considered under the intruder-resident or intruder-agriculture scenarios, respectively.

PERFORMANCE OBJECTIVE FOR THE PROTECTION OF INDIVIDUALS DURING OPERATIONS (10 CFR 61.43)

The performance objective for the protection of individuals during operations (10 CFR 61.43) requires that operations at the disposal facility will be conducted in compliance with the standards for radiation protection set out in 10 CFR Part 20, except for releases of radioactivity in effluents from the disposal facility, which will be governed by 10 CFR 61.41. In addition, the performance objective requires that radiation exposures during operations are maintained ALARA. The requirements of 10 CFR 61.43 apply to site workers as well as to members of the general public.

The guidance for evaluating compliance with 10 CFR 61.43 provided in the SRP is based on the observation that DOE is a self-regulating Federal agency with a history of managing doses to workers and to members of the general public. Neither the criteria of the NDAA nor the other sets of incidental waste criteria confer regulatory or statutory authority on the NRC with regard to DOE operational activities. Thus, the NRC expects that compliance with the performance objective of 10 CFR 61.43 will be demonstrated by demonstrating equivalency between DOE's regulations (10 CFR 835 "Occupational Radiation Protection") and the applicable sections of 10 CFR 20, which are listed in the SRP.

In addition to verifying that requirements of the applicable parts of 10 CFR 20 are covered by requirements of 10 CFR 835, the reviewer must assess how the requirements will be implemented. Thus, to assess compliance with 10 CFR 61.43, the reviewer should review how procedures and processes as radiation protection programs and documented safety analyses are implemented at the site. The reviewer also must review the site=s dose estimates and confirm that the estimated doses are below the applicable dose limits. However, because DOE has a history of estimating operational doses, the reviewer is not expected to review the technical bases for dose estimates in depth (e.g., the reviewer is not expected to review the assumptions made in accident analyses).

PERFORMANCE OBJECTIVE FOR DISPOSAL SITE STABILITY AFTER CLOSURE (10 CFR 61.44)

The performance objective for stability of the disposal site after closure (10 CFR 61.44) requires that a disposal facility 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 is required. Because the stability of a disposal site is important to its long term performance, the SRP directs reviewers to ensure that the effects of site instabilities are adequately modeled or bounded in any performance assessment or inadvertent intruder analysis used to support a demonstration of compliance with 10 CFR 61.41 or 10 CFR 61.42, respectively.

Several potential causes of site instability, including natural disruptive events, waste characteristics or facility design, are specifically addressed in 10 CFR 61. For example, natural disruptive events that have the potential to significantly degrade waste isolation by directly or indirectly affecting the engineered barriers or wasteform, including erosion, flooding, seismicity, and other disruptive events, are listed in 10 CFR 61.50. The SRP directs reviewers to assess how susceptible a waste disposal site is to these natural disruptive events and to assess whether there is reasonable assurance that waste isolation will not be compromised. Some traditional concerns regarding the stability of LLW are related to the stability of typical commercial Class A wastes such as contaminated lab trash, clothing, or plastics and are not expected to be relevant to waste determinations. However, other aspects of the stability of wastes described in 10 CFR 61.56(b), such as the structural stability of waste under the overburden expected after site closure, the effect of radiation and changing chemical conditions on the structural stability of the waste, the presence of free water in the waste, and the presence of void spaces in the waste (e.g., in abandoned equipment), may be relevant to incidental wastes. Similarly, the technical areas expected to affect disposal site stability described in 10 CFR 61.51, including the design of covers to limit water infiltration, the design of surface features to direct surface water drainage away from disposal units at velocities and gradients that will not result in erosion, and the design of the disposal site to minimize the contact of percolating or standing water with wastes after disposal, are all expected to be relevant to an assessment of the stability of an incidental waste disposal facility.

In addition to directing reviewers to evaluate the stability concerns described in 10 CFR 61, the SRP also provides specific guidance on applying the site stability requirement to waste determinations. For example, in many cases incidental waste may be mixed with or encapsulated in a cementitious material. If so, the reviewer would evaluate the potential for structural degradation due to leaching, sulfate attack, carbonation, corrosion of embedded metals, or by cracking caused by differential settling or seismic activity.

Another area in which the SRP provides specific guidance on applying the stability requirement to waste determinations is in the interpretation of the requirement of 10 CFR 61.44 that the disposal facility be sited to achieve long-term stability of the disposal site. In some cases, application of this requirement is clear because the waste can be removed from its original location to a disposal facility. For example, long-term site stability was considered in choosing the location for the Z-area disposal facility that will accept processed salt waste at the Savannah River Site. The application of the siting requirement to other forms of incidental waste, such as residual waste in existing HLW tanks that will be closed by being filled with grout, is less clear because the location of the waste is fixed. Although the site of the waste cannot be changed in these cases, the SRP advises reviewers that siting considerations should not be ignored; instead, the reviewer should evaluate whether any unfavorable siting conditions exist, and, if so, ensure that the unfavorable conditions will be mitigated by elements of the facility design. For example, one siting requirement identified in 10 CFR 61.50 is that waste should not be disposed of in the zone of water table fluctuation. The guidance provided in the SRP indicates that, if the reviewer determines that waste is likely to be impacted by water table fluctuation, the reviewer should pay particular attention to the review of features of the facility designed to limit the impact of water table fluctuation on the degradation of engineered barriers and on radionuclide release.

REVIEW DOCUMENTATION

The SRP describes the primary phases of review documentation, including DOE's submission of a draft waste determination and supporting information, potential development of a Request for Additional Information (RAI) by NRC staff (if additional information is necessary for the staff to complete its review), development of an RAI response by DOE, and NRC's final documentation of a review in a Technical Evaluation Report (TER).

As discussed in the SRP, a TER typically will include descriptions of DOE’s approach, areas reviewed by NRC staff, the assumptions made in conducting the review, and the conclusions as to whether there is reasonable assurance that each applicable waste criterion can be met. A TER may also include, in an appendix, recommendations for DOE’s consideration. The purpose of any recommendations is to communicate actions that DOE might consider in order to further improve its waste management approach, and do not need to be implemented in order for the applicable waste criteria to be met. For reviews conducted pursuant to the NDAA, the TER will identify the factors that are important to assessing compliance with 10 CFR Part 61, Subpart C for use in NRC’s monitoring activities.

The Commission has directed the staff to ensure that the technical basis for its decisions regarding waste determination reviews under the NDAA are as “transparent, traceable, complete, and as open to the public and interested stakeholders as practicable” [10]. Thus, with the possible exception of documents that DOE cannot publicly release because of security concerns, the NRC expects that draft waste determinations, supporting references, NRC’s RAI, DOE’s RAI responses and supporting references, meeting summaries, TERs, and any other relevant documents submitted by DOE or issued by NRC will be made publicly available.

MONITORING

Paragraph (b)(1) of the NDAA requires that the U.S. Nuclear Regulatory Commission (NRC) “...in coordination with the covered State, monitor disposal actions taken by the Department of Energy...for the purpose of assessing compliance with the performance objectives set out in Subpart C of Part 61 of Title 10, Code of Federal Regulations.” The NDAA requires that the NRC report any noncompliance to Congress, the State, and the U.S. Department of Energy (DOE) as soon as practicable after discovery of the noncompliant conditions and states that NRC=s monitoring is subject to judicial review. However, the NRC does not have regulatory or enforcement authority over DOE. The NDAA applies only to the States of South Carolina and Idaho, and these are the States in which NRC would monitor DOE’s disposal of non-HLW.

Because the SRP directs the staff to conduct monitoring activities in a risk-informed and performance-based manner, the staff is expected to focus monitoring on those aspects of DOE’s disposal activities that may affect whether the performance objectives of 10 CFR 61 Subpart C can be met. The specific areas monitored will depend significantly on the findings of the consultative technical review as documented in the TER. For example, the TER may identify areas such as wasteform degradation or infiltration rates as technical areas that are important to determining whether the performance objectives of 10 CFR 61 Subpart C can be met. In that case, the NRC staff would expect to monitor the results of experiments or site-specific observations that could provide support to assumptions made about predicted wasteform degradation or infiltration rates. In addition, the scope of the monitoring may depend on the conservatism in DOE’s analysis. If DOE uses assumptions that have been reviewed by the NRC staff and are found to be reasonably conservative or well supported by adequate technical bases, then monitoring in those areas may be limited to ensuring that the disposal actions are consistent with the approach described in the waste determination.

The SRP emphasizes that the factors listed in the TER may not comprise an all-inclusive list, and that the number or types of areas monitored may change as more is learned about the disposal methods or as DOE’s disposal plans proceed. For example, if inventory sampling is identified as a factor that is important to assessing compliance, monitoring of this factor may be complete after waste sampling is completed. Similarly, additional DOE or NRC analysis (e.g., performance assessment, groundwater modeling, or sensitivity and uncertainty analyses) could indicate that an area originally identified as being important to assessing compliance with the performance objectives of 10 CFR 61 Subpart C is not actually important to assessing compliance. In this case, that area may be removed from NRC’s monitoring plan. Alternatively, as a performance assessment or other modeling is refined and revised, an area not previously identified in the TER may be shown to be important to assessing compliance. For these reasons, the NRC staff performing the monitoring should remain aware of revisions to DOE’s modeling or disposal plans and review the effects of any changes on the predicted doses.

The NDAA requires that NRC provide a noncompliance report to Congress, the State, and DOE as soon as practicable after a noncompliance is discovered. As required by the NDAA, any final noncompliance report would be sent to the Congressional committees of the Committee on Armed Services, the Committee on Energy and Commerce, and the Committee on Appropriations of the House of Representatives, and the Committee on Armed Services, the Committee on Energy and Natural Resources, the Committee on Environment and Public Works, and the Committee on Appropriations of the Senate. Because NRC does not have regulatory or enforcement authority over DOE, it is the role of Congress, the State, and DOE to determine what, if any, actions will be taken in response to a noncompliance report.

PUBLIC COMMENTS

The draft SRP was released for public comment on May 31, 2006. Twelve public comment letters were received, including letters from DOE, the States of Idaho, Washington, and Oregon, the New York State Energy Research and Development Authority, the Natural Resources Defense Council, the West Valley Citizen Task Force, and four members of the public. Several commenters stated that the SRP provides a good technical basis for review of waste determinations, and two commenters indicated that they were glad the NRC was issuing such a document and allowing public comment. In general, commenting members of the public indicated they were not in favor of any process that allowed waste to be determined to be non-HLW or waste incidental to reprocessing. The NRC is evaluating the public comments received and plans to publish a final version of the SRP in 2007.

REFERENCES

1. U.S. Nuclear Regulatory Commission (NRC). "Standard Review Plan for Activities Related to U.S. Department of Energy Waste Determinations: Draft Report for Interim Use and Comment." NUREG-1854. May 2006.

2. U.S. Department of Energy (DOE). DOE Order 435.1, "Radioactive Waste Management Manual." DOE M 435.1-1. June 2001.

3. NRC. "Decommissioning Criteria for the West Valley Demonstration Project at the West Valley Site: Final Policy Statement." Federal Register. 67 FR 5003. February 2002.

4. NRC. "A Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities: Recommendations of NRC's Performance Assessment Working Group." NUREGB1573. October 2000.

5. NRC. "Branch Technical Position on Concentration Averaging and Encapsulation." January 1995.

6. NRC. "Final Environmental Impact Statement on 10 CFR Part 61 Licensing Requirements for Land Disposal of Radioactive Waste." NUREG-0945. 1982.

7. NRC. "Draft Environmental Impact Statement on 10 CFR Part 61 Licensing Requirements for Land Disposal of Radioactive Waste." NUREGB0782. Washington, DC. September 1981.

8. NRC. "Technical Evaluation Report for the U.S. Department of Energy, Savannah River Site Draft Section 3116 Waste Determination for Salt Waste Disposal." Letter from L. Camper to C. Anderson, DOE. December 2005.

9. Oztunali, O.I. and G.W. Roles. "Update of Part 61: Impacts Analysis Methodology, Methodology Report." NUREG/CR-4370. NRC. 1986.

10. NRC. "Staff Requirements - COMNJD-06-0006 – Implementation of NRC Responsibilities Under the Ronald W. Reagan National Defense Authorization Act." SRM-COMNJD-06-0006. June 2006.