PART 61: SITE SPECIFIC ANALYSES FOR DEMONSTRATING COMPLIANCE WITH SUBPART C PERFORMANCE OBJECTIVES
PRELIMINARY PROPOSED RULE LANGUAGE.

(MAY 2011)

The Nuclear Regulatory Commission (NRC) is making available preliminary proposed rule language and its associated regulatory basis document, which includes the "Technical Analysis Supporting Definition of Period of Performance for Low-Level Waste Disposal". The NRC is proposing to amend Part 61 to Title 10 of the Code of Federal Regulations to require low-level radioactive waste disposal facilities to conduct site-specific analyses to demonstrate compliance with the performance objectives in Part 61, which would enhance the safe disposal of low-level radioactive waste. These analyses would also identify any additional measures that would be prudent to implement. The NRC is also proposing additional changes to the regulations to reduce ambiguity, facilitate implementation, and to better align the requirements with current health and safety standards.

The availability of the preliminary proposed rule language and its associated regulatory basis documents is intended to inform stakeholders of the current status of the NRC's activities and solicit public comments on the information at this time. The NRC will review and consider any comments received for information only. The NRC will not respond to any comments received at this pre-rulemaking stage. As appropriate, the Statements of Consideration for the proposed rule will briefly discuss any substantive changes made to the proposed rule language as a result of comments received. Once published as a proposed rule, stakeholders will have an additional opportunity to comment on the proposed rule language and the NRC will respond to any such comments in the Statements of Consideration for the final rule.

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§ 61.7 Concepts.

(a) *The disposal facility*. (1) Part 61 is intended to apply to land disposal of radioactive waste and not to other methods such as sea or extraterrestrial disposal. Part 61 contains procedural requirements and performance objectives applicable to any method of land disposal. It contains specific technical requirements for near-surface disposal of radioactive waste, a subset of land disposal, which involves disposal in the uppermost portion of the earth, approximately 30 meters. Near-surface disposal includes disposal in engineered facilities which may be built totally or partially above-grade provided that such facilities have protective earthen covers. Near-surface disposal does not include disposal facilities which are partially or fully above-grade with no protective earthen cover, which are referred to as "above-ground disposal~~.~~". Burial deeper than 30 meters may also be satisfactory. Technical requirements for alternative methods may be added in the future. While there may not yet be detailed technical criteria established for all kinds of land disposal that might be proposed, alternative methods of disposal can be approved on a case-by-case basis as needed.

(2) Near-surface disposal of radioactive waste takes place at a near-surface disposal facility, which includes all of the land and buildings necessary to carry out the disposal. The disposal site is that portion of the facility ~~which is~~ used for disposal of waste and consists of disposal units and a buffer zone. A disposal unit is a discrete portion of the disposal site into which waste is placed for disposal. For near-surface disposal, the disposal unit is usually a trench. A buffer zone is a portion of the disposal site that is controlled by the licensee and that lies under the site and between the boundary of the disposal site and any disposal unit. It provides controlled space to establish monitoring locations, which are intended to provide an early warning of radionuclide movement. An early warning allows a licensee to perform any mitigation that might be necessary. 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.

(b) *Performance assessment.* (1) Many features, events, and processes can influence the ability of a waste disposal facility to limit releases of radioactivity to the environment. Disposal system behavior is characterized by the disposal facility design, the characteristics of the waste, and the geologic and environmental characteristics of the disposal site. A performance assessment evaluates the behavior of a radioactive waste disposal system and the uncertainties in the system.

(2) The performance assessment identifies the specific characteristics of the disposal site (e.g., hydrology, meteorology, geochemical, biotic, geomorphology, etc.); degradation, deterioration, or alteration processes of the engineered barriers (including the waste form and container); and interactions between the site characteristics and engineered barriers that might affect the performance of the disposal facility. The performance assessment examines the effects of these processes and interactions on the ability of the disposal facility to limit waste releases and calculates the annual dose to a member of the public for comparison with the appropriate performance objective of Subpart C of this part.

~~(b)~~ (c) * * *

(1) Disposal of radioactive waste in near-surface disposal facilities has the following safety objectives: protection of the general population from releases of radioactivity, ~~protection of individuals from inadvertent intrusion~~ protection of inadvertent intruders, protection of individuals during operations~~. A fourth objective is to ensure stability of the site after closure~~, and ensuring stability of the site after closure.

(2) A cornerstone of the system is stability—stability of the waste and the disposal site ~~so that once emplaced and covered, the access of water to the waste can be minimized. Migration of radionuclides is thus minimized, long-term active maintenance can be avoided, and potential exposures to intruders reduced. While stability is a desirable characteristic for all waste much radioactive waste does not contain sufficient amounts of radionuclides to be of great concern from these standpoints; this waste, however, tends to be unstable, such as ordinary~~

~~trash type wastes. If mixed with the higher activity waste,~~ — 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 avoids the need for long-term active maintenance and reduces the potential for inadvertent intruders to be exposed to the waste. While stability is desirable; it isn't necessary from a health and safety standpoint for most low-level waste because the waste doesn't contain sufficient radionuclides to be of concern. This low-activity waste (e.g., ordinary trash-type waste) tends to be unstable, which can become a problem if it is mixed with higher activity waste. If lower activity waste is mixed with the higher activity waste, ~~their~~ the deterioration of the unstable waste could lead to the failure of the system and could permit water to penetrate the disposal unit, which could cause problems with the higher activity waste. Therefore, ~~in order~~ to avoid placing requirements for a stable waste form on relatively innocuous wastes, these wastes have been classed as Class A waste~~. Class A waste will be~~ , which will be disposed of in separate disposal units at the disposal site. However, Class A waste that is stable may be ~~mixed~~ disposed of with other classes of waste. ~~Those higher~~ Higher activity wastes that should be stable for proper disposal are classed as Class B and C waste. To the extent that it is practicable, Class B and C waste forms or containers should be designed to be stable (i.e., to maintain gross physical properties and identity) over 300 years. The stability of long-lived waste may be more uncertain and require a more robust technical evaluation of the processes that are unlikely to affect the ability of the disposal system to isolate short-lived waste. For long-lived waste and ~~For~~ 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.

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(5) Waste that will not decay to levels ~~which~~ that present an acceptable hazard to an intruder within 100 years is designated as Class C waste. ~~This waste is~~ 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 inadvertent 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. A maximum concentration of radionuclides is specified ~~for all wastes~~ in Tables 1 and 2 of § 61.55 so that at the end of the 500-year period, the remaining radioactivity will be at a level that does not pose an unacceptable hazard to an inadvertent intruder or to public health and safety. Waste with concentrations above these limits is generally unacceptable for near-surface disposal. There may be some instances where waste with concentrations greater than permitted for Class C would be acceptable for near-surface disposal with special processing or design. Disposal of this waste will be evaluated on a case-by-case basis. ~~Class C waste must also be stable.~~

(6) 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 hazard 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.

(7) An intruder assessment quantitatively estimates the radiological exposure of an inadvertent intruder at a disposal facility following the loss of institutional control. The results of the intruder assessment are compared with the appropriate performance objective. The intruder assessment must identify the intruder barriers and examine the performance of the barriers. The intruder assessment must also address the effects of uncertainty on the performance of the barriers. The barriers must inhibit contact with the disposed waste or limit the radiological exposure of an inadvertent intruder over the duration of the compliance period. 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 after closure and engages in activities that unknowingly expose the intruder to radiation from the waste.

~~(c)~~ (d) * * *

(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 ~~bahalf~~ 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.

§ 61.12 Specific technical information.

The specific technical information must include the ~~following information needed for demonstration~~ following to demonstrate that the performance objectives of Subpart C of this part and the applicable technical requirements of Subpart D of this part will be met:

(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.

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§ 61.13 Technical analyses

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(a) A performance assessment must represent features, events, and processes that can influence the ability of the waste disposal facility to limit releases of radioactivity to the environment. The features, events, and processes considered in the performance assessment must represent a wide range of both beneficial and potentially adverse effects on performance. The performance assessment must consider the specific technical information provided in § 61.12(a) through (i). The performance assessment must evaluate uncertainties in the projected behavior of the facility. The performance assessment must identify the specific characteristics of the disposal site that are necessary to demonstrate compliance with the performance objectives in Subpart C of this part consistent with the specific technical information found in § 61.12. The performance assessment must also identify the degradation, deterioration, or alteration processes of the engineered barriers (including the waste form and container) and interactions between the site characteristics and engineered barriers that might affect the performance of the disposal facility. Pathways analyzed in demonstrating protection of the general population from releases of radioactivity must include air, soil, groundwater, surface water, plant uptake, and exhumation by burrowing animals. The analyses must clearly identify and differentiate between the roles performed by the natural disposal site characteristics and design features in isolating and segregating the wastes. The analyses must demonstrate that there is reasonable assurance that the exposure to humans from the release of radioactivity will not exceed the limits in § 61.41.

(b) Analyses of the protection of individuals from inadvertent intrusion must ~~include demonstration~~ demonstrate that there is reasonable assurance that the waste classification and segregation requirements will be met ~~and~~, that adequate barriers to inadvertent intrusion will be

provided, and that the exposure to any inadvertent intruder will not exceed the limits set forth in § 61.42 as demonstrated in an intruder assessment.

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(e) (1) Analyses that discuss how the design of the facility considers the potential long-term radiological impacts, consistent with available data and current scientific understanding. The analyses must identify and describe the features of the design and site characteristics that will reduce long-term impacts.

(2) Analyses of long-lived waste must calculate the peak annual dose that would occur 20,000 or more years after site closure. No dose limit applies to the results of these analyses, but the analyses must be included to indicate the long-term performance of the land disposal facility.

§ 61.28 Contents of application for closure.

(a) * * *

(2) The results of tests, experiments, or any other analyses relating to backfill or excavated areas, closure and sealing, waste migration and interaction with emplacement media, or any other tests, experiments, or analysis pertinent to the long-term containment of emplaced waste within the disposal site, including revised analyses for § 61.13 using the details of the final closure plan and waste inventory.

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§ 61.41 Protection of the general population from releases of radioactivity.

(a) Concentrations of radioactive material ~~which~~ 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 ~~25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public~~ 25 millirems total

effective dose equivalent to any member of the public. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.

(b) Compliance with paragraph (a) of this section must be demonstrated through a performance assessment that evaluates peak annual dose up to 20,000 years following closure of the disposal facility.

§ 61.42 ~~Protection of individuals from inadvertent intrusion~~ Protection of inadvertent intruders.

(a) Design, operation, and closure of the land disposal facility must ensure protection of any ~~individual inadvertently intruding~~ 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 500 millirems total effective dose equivalent.

(b) Compliance with paragraph (a) of this section must be demonstrated through an intruder assessment that evaluates peak annual dose up to 20,000 years following closure of the disposal facility.

§ 61.52 Land disposal facility operation and disposal site closure.

(a) * * *

(12) Waste will be disposed of consistent with the description provided in § 61.12(f), and the technical analyses required by § 61.13.

§ 61.55 Waste classification.

(a) * * *

(6) Classification of wastes with radionuclides other than those listed in Tables 1 and 2 of this section. If radioactive waste does not contain any nuclides listed in either Table 1 or 2 of this section, it is Class A. Any waste classified under this subparagraph must be analyzed in the intruder assessment required by § 61.42.

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