

## TECHNICAL POSITIONS IMPLEMENTING 10 CFR PART 61

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### ABSTRACT

The Low-Level Waste Licensing Branch of the Nuclear Regulatory Commission is developing a series of technical positions implementing the proposed 10 CFR Part 61. These technical papers will cover the following subjects related to near-surface disposal facilities: site selection, suitability and characterization; facility design and operations; waste form; waste classification; site and personnel monitoring; site closure, stabilization, and post-operational surveillance; and funding assurances for closure and long-term custodial care. Additional technical positions, such as site performance modeling, are under consideration. In addition, the Office of Nuclear Regulatory Research is preparing Standard Format and Content Guides for License Applications and Environmental Reports.

The technical position papers will serve to expand on the staff's interpretation of the performance objectives and technical requirements in the proposed 10 CFR Part 61 and to provide guidance to the states, nuclear industry, and prospective licensees in advance of regulatory guides on the same subjects. In this manner, the technical position papers should facilitate the licensing process for near-surface disposal facilities for low-level radioactive wastes.

The technical position paper on site closure, stabilization, and post-operational surveillance has been completed. Preliminary drafts of technical position papers for site selection, suitability and characterization; waste form; and waste classification are undergoing revision to incorporate internal review and informal technical comments received. The technical position papers on facility design and operations and on funding assurances are undergoing internal review.

Contractual support providing background for the technical positions is currently in progress at the U.S. Army Corps of Engineers Waterways Experiment Station, Oak Ridge National Laboratory, the Illinois State Geological Survey, Brookhaven National Laboratory, Pacific Northwest National Laboratory, and Dames & Moore.

## INTRODUCTION

The Low-Level Waste Licensing Branch of the Nuclear Regulatory Commission is developing a series of technical position papers implementing the proposed 10 CFR Part 61. As illustrated in Table I, these technical position papers will cover three distinct aspects of near-surface disposal of low-level radioactive wastes; namely, waste generation, the disposal site, and institutional controls.

TABLE I. TECHNICAL POSITIONS IMPLEMENTING 10 CFR PART 61

### Waste Generation

Waste Form  
Waste Classification

### Disposal Site

Site Suitability, Selection, and Characterization  
Facility Design and Operations  
Site and Personnel Monitoring  
Site Closure, Stabilization and Post-Operational Surveillance

### Institutional Controls

Funding Assurances for Closure and Long-Term Custodial Care

Additional technical position papers on subjects such as modeling site performance, quality assurance for geotechnical quality control, ALARA programs at disposal sites, and technical positions to facilitate amendments to the proposed rule are under consideration. In addition, the Office of Nuclear Regulatory Research is preparing Standard Format and Content Guides for License Applications and Environmental Reports.

The technical position papers will expand on the staff's interpretation of the performance objectives and technical requirements in the proposed 10 CFR Part 61. One key aspect of these will be the staff positions on how a licensee should proceed to accomplish or satisfy these performance objectives and technical requirements.

The purpose of the technical position papers is to provide guidance to the states, nuclear industry, and prospective licensees in advance of regulatory guides on the same subjects. This early-on guidance should facilitate the licensing process for near-surface disposal facilities for low-level radioactive wastes and increase the certainty that the performance objectives and technical requirements in the proposed rule will be met.

The schedule for completing these technical position papers is shown in Table II.

TABLE II. SCHEDULE FOR COMPLETION

Waste Generation

Waste Form	Summer 1982
Waste Classification	Summer 1982

Disposal Site

Site Suitability, Selection and Characterization	Spring 1982
Facility Design and Operations	Fall 1982
Site and Personnel Monitoring	Spring 1983
Site Closure, Stabilization and Post-Operational Surveillance	Spring 1979

Institutional Controls

Funding Assurances for Closure and Long-term Custodial Care	Summer 1982
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The following discussions will cover the four technical position papers that have been completed or have been made available informally in a draft version. This includes the papers on waste form; waste classification; site suitability, selection and characterization; and site closure, stabilization, and post-operational surveillance. Since my technical background and responsibility is in siting and design, I will emphasize the latter two papers.

## WASTE GENERATION

The proposed 10 CFR Part 61 establishes a waste classification system for low-level radioactive wastes based on the radioisotopic concentrations in the wastes. This classification system identifies explicitly three classes of wastes suitable for near-surface disposal, i.e., Class A segregated wastes, Class B stable wastes, and Class C intruder wastes. The classification system implicitly identifies a fourth class of wastes, namely those having radioisotopic concentrations generally considered not suitable for near-surface disposal.

The three classes of wastes for near-surface disposal are required to meet certain minimum requirements to facilitate handling and to provide protection against external radiation exposure to site workers. In addition, stability requirements have been placed on Class B and Class C wastes. The technical position paper on waste classification addresses how the waste generator determines and documents the classification of the wastes. The technical position paper on waste form addresses how the waste generator meets the stability requirements for the Class B and Class C wastes.

### Waste Classification

The purpose of this paper is to provide a means of complying with the requirements in the proposed 10 CFR Part 61 on the classification of specific wastes. The paper suggests methods that can be used to determine and identify the concentration of radionuclides in the waste, and hence its classification. Three basic programs have been identified which may be used individually or in combination. These programs are materials accountability, gross or inferred radioactivity measurements, and sampling for direct measurement of specific radionuclides. Based on our supporting studies for the proposed rule, we have attempted to outline a practical procedure that could be used for classifying

wastes.

The paper also discusses shipping manifests for documenting the contents of the wastes. The purpose of these are twofold, (1) to provide documentation of the classification on the wastes, and (2) to provide the information the staff has determined is needed to evaluate the long-term performance of the site. Table III lists the information that would be provided on the shipping manifests.

TABLE III. WASTE CHARACTERISTIC INFORMATION ON SHIPPING MANIFESTS

Type of waste  
Waste volume and mass  
Radionuclide identity and concentration  
Total radioactivity  
Chemical form  
Solidification agent  
Waste class (based on Table I, Section 61.55, 10 CFR Part 61)

#### Waste Form

Waste forms for Class B and Class C wastes are required to maintain their gross physical properties over the long-term under the expected disposal conditions. To assure that the waste form will meet the requirements, the conditions shown in Table IV should be met.

TABLE IV. WASTE FORM STABILITY

Solid/solidification form or container/structure  
Free liquids less than 1% of waste volume  
Non-degrading by radiation  
Non-biodegradable  
Withstand compressive loads of overburden and equipment  
Non-degradable by moisture/water

Three aspects of waste form are discussed in the paper; 1) guidance on the solidification of wastes, 2) design guidance for high integrity containers, and 3) guidance on maximum loading of organic resins, above which radiation induced degradation would be a concern. The paper establishes standard tests that could be performed on proposed solidified waste forms. These include such things as compressibility and leachability. The staff recognizes

that these tests do not specifically indicate how these wastes forms will perform under actual disposal conditions. They are, however, the tests that have been performed on previously used waste forms and thus give us a measure of comparability. We currently have work underway which if successful, should permit correlation of these standard test results to actual conditions at specific sites. In the meantime, by using these standard tests, we will continue to accumulate a consistent data base.

Based on our studies to date, the position paper will also discuss minimum design criteria for high integrity containers. The primary concerns are, again, those shown in Table IV.

As a result of the work that has been done on wastes coming from cleanup of Three Mile Island Unit 2, we have determined that limits should be placed on loadings of high organic resins. The limits, and the bases for that limit, are also discussed in the position paper. It has been observed that when organic resins are loaded above 10 curies per cubic foot, the resins can degrade. This degradation tends to result in, among other things, the production of flammable gases. Therefore, the limit was established to avoid these kinds of problems.

#### DISPOSAL SITE

As indicated by the requirements in the proposed 10 CFR Part 61, near-surface disposal of low-level radioactive wastes is generally restricted to disposal of wastes with a radiological hazard of less than 500 years in the upper 15 to 20 meters of the earth's surface. In general, disposal will be in unsaturated or partially-saturated soil deposits above the fluctuations of the water table.

#### Site Suitability, Selection and Characterization

The purpose of the paper is to provide guidance in three areas: site suitability requirements, site selection, and site characterization activities. Site suitability requirements of the proposed rule are discussed in detail as to the staff's views on how each requirement can be met. In those cases where appropriate, we have attempted to present field methods, laboratory tests, analyses, etc. that can be utilized to show compliance with the requirement.

For site selection, the staff recognizes that the actual processes that may be used may vary considerably depending on both the applicant and a wide variety of other factors. However, we anticipate that site selection will probably follow the same basic steps from defining a region of interest, to selecting a slate of candidate sites, to final selection of the preferred site. The staff has described this process very briefly. The main emphasis of the paper is the role that site selection plays in the NEPA regulations which require a comparison of alternatives.

Site characterization is the program that will be performed at the proposed designated site to determine site-specific characteristics. The overall objective is to investigate the characteristics to the extent needed to 1) support a license application and the environmental report, and 2) permit an independent evaluation of the site suitability and expected performance of the proposed disposal facility by the staff. Each of the areas is discussed in more detail below.

The site suitability requirements in Section 61.50 of the proposed rule are intended to function collectively with requirements on site design, facility operation, site closure, waste classification and segregation, waste form and packaging, and institutional controls to help assure isolation of the low-level radioactive wastes for the duration of the radiological hazard and to provide stability of the disposal site after closure.

The staff fully expects that the site characteristics of any proposed near-surface disposal facility will make a significant contribution to the isolation of low-level radioactive wastes and the stability of the disposal site after closure. Since license applications are anticipated for near-surface disposal facilities in several different geographical areas exhibiting a wide range of geologic, hydrologic, meteorologic, and climatic conditions, the staff recognizes that the contribution of the site characteristics may vary from site to site.

The staff, in its review of a license application, will emphasize the long-term contribution of the site characteristics because the reliance which can be placed on other areas, such as design features, waste form and packaging, and institutional controls, will decrease with increasing time after site closure.

The site suitability requirements are minimum technical requirements and the staff fully anticipates that any proposed disposal site will meet these minimum technical requirements. The staff foresees very few instances where proposed disposal sites not meeting the minimum technical requirements would be acceptable.

The site selection process in separate applications for sites may vary considerably due to a wide variety of factors; however, the NRC staff anticipates that the site selection processes will share the same basic steps.

The first step will consist typically of defining the region of interest, such as the area within the geographic boundaries of an individual state or regional compact. The second step will consist of screening the region of interest to identify potential sites. In the third step, the potential sites will be screened against a common set of criteria, including the minimum technical requirements in 10 CFR Part 61 and the environmental standards in 10 CFR Part 51. The third step is envisioned as a coarse screening process which will identify a slate of candidate sites for more detailed review.

The fourth step will consist typically of a detailed review of the slate of candidate sites identified through the coarse screening. The first four steps will rely primarily upon available reconnaissance-level information. The primary differences between the steps will be the level of detail of the review and the inclusion of additional items to be evaluated in each step. For example, the fourth step may include items such as conceptual designs, preliminary cost estimates, release scenarios and pathway studies which were not included in the previous steps. The fourth step will conclude with the selection of a preferred site from among the candidate sites.

Site characterization is defined, for purposes of this technical position paper, as the program of investigations and tests, both in the field and laboratory, undertaken to define the site characteristics affecting the isolation of the low-level radioactive wastes, the long-term stability of the disposal site, and the interactions between the disposal site and its surroundings. Site characterization studies should be performed after selection of a proposed disposal site and prior to submittal of a license application and environmental report for a proposed



near-surface disposal facility. As indicated previously, the staff anticipates that, in most cases, site characterization studies will be performed only at the proposed disposal site.

To facilitate site characterization, and to minimize costly and time-consuming requests for additional information, the staff encourages license applicants to discuss their plans with the staff prior to embarking on them. Our intent is to assure that staff needs will be met, to the extent we can, at an early stage in the process.

One problem experienced at several existing low-level radioactive waste disposal facilities has been the identification of site conditions during site operations which were not adequately investigated and evaluated during the site characterization programs. In several instances, the additional information has caused the staff to raise questions related to the ability to adequately model and monitor the potential migration of radionuclides in the site ground-water systems. Such concerns have played a part in the closure of several low-level radioactive waste burial sites prior to complete utilization of the sites. Therefore, the staff takes the position that the site characterization program for any proposed near-surface disposal facility should be planned, implemented, and analyzed by a technical staff with professional expertise and experience in each of the various disciplines. This technical staff may be internal to the applicant's organization or may be retained by standard consulting arrangements.

The site characterization program for any proposed disposal site must be specifically tailored to the characteristics of the disposal site. Hence, site characterization programs will vary from site to site. In addition, the site characterization program for any site can be expected to be revised as the program progresses and more site-specific information is learned about the site.

Many of the site characteristics measured during the site characterization program will vary with time. Examples include meteorological characteristics such as temperature, wind direction and precipitation, hydrological characteristics such as soil moisture content and ground-water levels, and ecological characteristics such as the presence of migratory species. For these, a minimum one-year period of measurement is needed at the proposed disposal site. This minimum one-year period of record

should be supplemented, where possible, with regional data covering a longer time period.

Data collection points established in the site characterization studies should also serve for the pre-operational monitoring program. These data collection points should, to the extent practicable, be located, designed, and constructed for use throughout the life of the near-surface disposal facility. In this manner, there will be a common data set from which potential health and environmental impacts can be identified, long-term effects of changes in site characteristics on radionuclides migration and stability of the disposal site can be evaluated, and the need for mitigating measures can be determined.

#### Site Closure, Stabilization, and Post-Operational Surveillance

The staff recognizes that the site closure, stabilization, and post-operational surveillance required at a site will vary depending on site or region specific parameters, such as geology, hydrology, and climate. The operating history of the disposal facility site performance, site inventories, and anticipated future use of the site will also be important factors. The overall objective is to leave the site in a condition such that the need for active ongoing maintenance is eliminated and only passive maintenance and monitoring are required.

The staff views site closure and stabilization as a continuing activity, i.e., the staff anticipates that disposal units will be closed and stabilization will be accomplished as waste disposal proceeds and problems associated with premature discontinuance of disposal will be avoided.

The closure and stabilization objectives listed in Table V were developed for the technical position in 1979.

TABLE V. CLOSURE AND STABILIZATION OBJECTIVES

1. Waste buried in accordance with license
2. Decontaminate and dismantle/transfer structures
3. Document arrangements for transfer/funding
4. Direct gamma within few percent of background
5. Actual/predicted releases within 10 CFR Part 20, App. B
6. Passive maintenance
7. Trench bottoms above water table
8. Stable site surface/trenches

9. Adequate trench markers
10. Transfer of records
11. Establish buffer zone for monitoring/mitigation
12. Passive site security system
13. Comprehensive monitoring program
14. Resolve action level measurements
15. Eliminate active water maintenance
16. Evaluate effects of off-site activities

The closure and stabilization objectives have been applied, with site-specific modifications, to the Sheffield proceedings. In addition, they have been largely incorporated by the States of Washington and South Carolina in the licenses for the Richland and Barnwell sites.

It should be noted that our experience in applying them to existing sites and the studies associated with development of the proposed 10 CFR Part 61 and the Environmental Impact Statement have indicated that some changes will be made to these objectives. For example, 10 CFR Part 61 requires that doses at the site boundary not exceed 25 mrem/yr. As another example, the staff recognizes that the intent of objective 9 is establishment of a system so that trenches can be accurately located in the future, and not necessarily for trench markers. Therefore, the staff foresees that in the future this technical position will be updated and revised.

#### CONCLUSION

The WMLL staff is preparing a series of technical position papers which will expand on the technical requirements in the proposed 10 CFR Part 61 to provide guidance in advance of regulatory guides. Each technical position paper has been or will be available in a draft version for informal comments. These comments improve the quality of the papers and focus staff attention on how the positions translate into actual application at a near-surface disposal facility.