UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

# REQUEST FOR ADDITIONAL INFORMATION

# RELATED TO NUCLEAR ENERGY INSTITUTE (NEI)

# TECHNICAL REPORT NEI 22-01

# LICENSE TERMINATION PROCESS

By letter dated January 6, 2025, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML25006A201), the Nuclear Energy Institute (NEI) requested formal U.S. Nuclear Regulatory Commission (NRC) endorsement of technical report NEI 22-01, Revision 1, "License Termination Process," on behalf of its members. NEI 22-01 was developed to assist decommissioning reactor licensees in the development of License Termination Plans (LTPs) that satisfy NRC requirements and provide an approach that aligns with previously published NRC guidance.

The NRC staff has reviewed the information submitted and determined that additional information is required to complete its review. The specific requests for additional information (RAIs) are listed below. The topics of these RAIs were identified in the summary of the March 6, 2025, public meeting (ML25087A010) as topics warranting further dialogue between NEI and the NRC staff. Included below the RAIs are some additional observations that the NRC staff have identified that may take additional time to address. Responses provided to the observations in conjunction with the RAIs would support the remainder of the review and a determination regarding an extension to the fee waiver request.

## RAI 1 Determining Dose Contributions from Backfill

Basis:

In response to NRC Suggestion 2.23 in the letter dated April 30, 2024, NEI added additional language to a Subsection of 5.2.8, "Use of Soil and Demolition Debris as Backfill," of NEI 22-01, Revision 1. This new language included

- A citation of NUREG-1757, Volume 2, Revision 2, "Consolidated Decommissioning Guidance, Characterization, Survey and Determination of Radiological Criteria" (ML22194A859) and DUWP-ISG-02, "Radiological Survey and Dose Modeling of the Subsurface to Support License Termination," date October 2023 (ML23177A008).
- A statement that backfill from onsite should be characterized to rigor of final status surveys (FSS), compared to applicable Derived Concentration Guideline Levels (DCGL).
- A statement that if a licensee assumes there is no added residual radioactivity in backfill, support should be provided for this assumption. If there is uncertainty that soils are from

a non-impacted areas, a statistical test such as a Scenario B type analysis could be used.

- A discussion of the Zion plant, as an example, which NEI states, “a license conservatively assumed that soil contained licensed material at [MDC]… even though there were no detectable radionuclides present. Although conservative assumptions are sometimes used to simplify dose modeling, the use of [MDC] values as real characterization data is not required or recommended.”
- A statement that licensees should continue to discuss proposed plans with NRC since there are complex issues associated with measurement capabilities and site-specific dose assessments.

During the March 6, 2025 public meeting, NRC and NEI concluded that additional discussion on this topic was needed.

Issue:

During the March 6, 2025, public meeting NEI disagreed with the concept of assigning dose to radionuclides of concern (ROCs) that are below detection limits for impacted materials. NEI pointed to NUREG-1575, “Multi-Agency Radiological Survey and Site Investigation Manual” (MARSSIM),” Section 2.3.5, which provides guidance to ‘Report the actual result of the analysis. Do not report data as “less than the detection limit.’ Even negative results and results with large uncertainties can be used in the statistical tests to demonstrate compliance.”

The NRC staff notes that there is some confusion around the idea of “detection limits” and related terminology such as the critical level (Lc), MDC, and lower limit of detection (LLD). Detailed information on this topic can be found in MARLAP, Chapter 20, “Detection and Quantification Capabilities,” and Attachment 3B, “Analyte Detection.” MARLAP recommends that when a detection decision is required, it should be made by comparing the measured value to its critical value, which is a measure of detection limit, and not to the MDC or LLD. As pointed out by NEI, MARSSIM Section 2.3.5 recommends reporting the actual results of analysis, even negative results. NRC agrees that, ideally, initial reporting should include actual results and not zero out any negative values. However, while negative values may be appropriate to use for MARSSIM statistical tests or summary statistics, negative results should not be used when determining compliance doses, because a negative dose is not a realistic concept. When conducting any sort of dose estimate, negative results could either be zeroed out on an individual basis or zeroed out after all sample results are averaged. Zeroing out negative averages is a method that is most likely to minimize bias in the results.

In either scenario, if the analytical result is between the critical level and MDC (a posteriori), the result should not be set to zero. If results are reported as “<MDC,” then the MDC should be used for a dose estimate. If actual result values are reported, then those results or MDC value could be used for dose estimates. If an individual sample measurement result is below the defined critical level, the value should still be reported, but the result can be noted as a non-detect and can be zeroed out for dose estimated purposes. However, if results were below MDC (a posteriori), but above the critical level, samples could not be considered non-detectable, and the value could not be zeroed out.

When assessing potential dose from backfill, some traditional sampling of fines (small concrete debris) may be a more practical way of assessing the potential dose from using impacted materials as backfill. It may be worth considering the backfill a class 3 well mixed survey unit with samples taken at various intervals of backfill.

Request:

Further discussions between NEI and the NRC staff are warranted on the topic of assessing potential dose from backfill. Based on these discussions, NEI should add specific language to Section 5.2.8 stating that reporting of actual results is recommended along with a discussion regarding the use of negative values for summary statistics and statistical tests vs. dose estimation as outlined above.

**RAI 2 Reporting Groundwater Radionuclide Results**

Basis:

The guidance in NUREG-1576, "Multi-Agency Radiological Laboratory Analytical Protocols [MARLAP] Manual," dated July 2004, provided definitions for critical level and minimum detection concentration (MDC) on which to base detection decisions for water samples. This information is needed to assure compliance with 10 CFR 20.1501, "General," that the site has been adequately characterized.

Issue:

In the March 6, 2025, public meeting between the NRC staff and NEI, it was stated that continued discussion of the detection decision and use of analytical results in the range between the critical level and MDC may be needed.

Section 2.2 of NEI 22-01 describes analytical results relevant to laboratory analyses of samples in a framework consistent to MARLAP. However, Section 2.2 did not provide a statement of what should be reported. The NRC staff notes that the use of analytical results for estimates of groundwater contamination or dose should not follow a MARSSIM-type statistical treatment. The NRC staff additionally acknowledge that there are some site and LTP dependencies for treatment and use of analytical results for groundwater. Dependencies include magnitude of the allotment of dose for existing groundwater contamination, magnitude of contamination, claim of zero contamination, and groundwater quality. An NRC review would focus on potential underestimation of dose.

For results between the Lc and MDC, reporting of results should include the critical level, the analytical result, and the MDC (*a posteriori*). For results above the MDC, only the analytical results need to be reported. Any result below the Lc value can be treated as zero radioactivity. MARLAP guidance indicated that the results in the range between the Lc and MDC are unreliable (and if reliability is needed, a more refined analytical approach should be used) but that any value above the critical level is statistically interpreted as a detection of radioactivity. Staff acknowledges that results close to the Lc value are potentially false positives from a statistical standpoint. Support for a false positive conclusion may include reanalysis or resampling and preponderance of results. Therefore, if the analytical result falls between the critical level and MDC (*a posteriori*), the result should not be set to zero. If results are reported as <MDC, then the MDC should be used for a dose estimate. If actual analytical result values are reported, then either those results or the MDC value can be used for dose estimates.

If an alternative approach for reporting analytical results is provided, then the licensee should provide supporting information on how that alternative approach meets the intent of the MARLAP guidance. Most commonly, sites that retain the usage of lower limits of detection

terminology should provide information on their detection decision such that dose is not underestimated.

Request:

Clarify in NEI 22-01 the treatment and reporting of analytical results that fall between the critical level and the MDC for estimating residual radioactivity and dose due to residual radioactivity in groundwater. Clarify the interpretation of laboratory analytical results between the critical level and MDC. Discussions between NEI and the NRC staff are warranted to ensure agreement on the clarifications.

**RAI 3 Sorption Coefficient (Kd) Estimates**

Basis:

In response to NRC Suggestion 2.49 in the letter dated April 30, 2024, NEI revised text to Section 6.1.2, “Evolution of Dose Model Scenarios,” in NEI 22-01, Revision 1, to address the selection of $K_d$ values. Sorption coefficients are an important RESRAD input for estimating DCGLs and the dose from residual radioactivity at a site. The NRC must have reasonable assurance that the dose-based requirements in 10 CFR Part 20, “Standards for Protection Against Radiation,” Subpart E, “Radiological Criteria for License Termination,” are met to reach favorable decisions regarding license termination.

Issue:

In the March 6, 2025, public meeting, a discussion was held regarding the text in Section 6.1.2, which appears to emphasize the use of measurements to support the Kd values and does not provide a lot of detail on alternate approaches or the treatment of uncertainty with respect to potentially underestimating dose. DUWP-ISG-02 provides several methods and considerations for estimating Kd values for a site with the suggestion that a graded approach should be selected based on site conditions, data availability, dose modeling approach, and treatment of Kd inputs in RESRAD (e.g., site-based uncertainty versus selection 25/75 percentile based on generic tables).

Request:

Clarify in the NEI 22-01 guidance that measurements of sorption coefficients are not required at sites based on NRC’s guidance in DUWP-ISG-02. Further discussions between NEI and the NRC staff are warranted on what is meant by site-dependent information and representativeness of site information to the appropriate media (e.g., contaminated zone or groundwater flow pathways).