Overview of NEI 22-01, Rev. 1, License Termination Process

NRC Public Meeting

March 6, 2025

NUCLEAR ENERGY INSTITUTE

Meeting Objectives

- Describe the changes and improvements made to NEI 22-01, License Termination Process including the industry responses to the NRC suggestions and recommendations provided by NRC letter dated April 30, 2024 (Revision 1 submitted to NRC January 6, 2025).
- Discuss several topics where industry believes further clarification is warranted and where efficiencies can be realized.
- Discuss next steps.

Opening Comment

The industry appreciates the NRC's significant contribution to the quality and comprehensiveness of the guidance in NEI 22-01 and looks forward to a continuing dialog on how to achieve efficiencies in the license termination process.

Topics Requiring Further Clarification/Discussion

NRC Suggestion	NRC Comment Title and Summary of Comment	Addressed in NEI 22-01, Rev 1
2.8	**Appendix H - Future Discrete Radioactive Particles Guidanc**e - NRC suggests references for use in preparing guidance	2.1, 3,2, 4.5, 5.1.4, Appendix H
2.9	**In-Situ Gamma Spectroscopy** - Use of In-situ should be "proofed" through the collection and analysis of actual soil samples	2.1.2 last subsection
2.20	**Scan Coverage Requirements** - Suggest that NEI 22-01 include the scan coverage requirement in MARSSIM Rev 2	5.2.1
2.23	**Use of Soil or Concrete as Backfill** - Suggest additional details are needed on methods for determining the dose contributions from the reuse of materials. Suggest referencing NUREG-1757, Revision 2 and DUWP-ISG-02 in NEI 22-01 on this topic.	5.2.8
2.29	**Zion Subsurface Soil FS**S - Design of FSS for subsurface soil using the DQO process needs to consider differences between surface and subsurface contamination	5.3.2
2.49	**Parameter Sensitivity Analysis** - NEI 22-01 should be made consistent with the guidance provided in NUREG-1757, Volume 2, Revision 2, concerning parameter selection.	6.1.2
2.54 #5	**Section 2.3.3** - Sampling for insignificant radionuclides in FSS	2.5.3

2.8: Appendix H – Future Discrete Radioactive Particles Guidance

NRC Suggestion:

Section 2.1 of NEI 22-01 discusses Appendix H as future guidance for discrete radioactive particles (DRPs). There is a need to address characterization and survey approaches to DRPs, as well as to address characterization and survey approaches regarding dose impacts and safety of workers, that may constitute an appreciable fraction of NRC dose limit to the public. The methods used and the sensitivities achieved in the search for environmentally dispersed particles during the various decommissioning activities performed have been discussed in several aspects. The NRC staff suggests assessing the following as you prepare Appendix H:

- Discussion questions for DRP in the November 3, 2022, Decommissioning Workshop
- NUREG/IA-0535, “Using VARSKIN for Hot Particles Ingestion Dosimetry Evaluation”
- Estimating Scan Minimum Detectable Activities of Discrete Radioactive Particles -Technical Report
- Renaissance Code Development Presentation of DRP Dose Coefficient

Changes to NEI 22-01 for NRC Suggestion 2.8:

- Section 2.1 adds statement that consideration should be given to the presence of discrete radioactive particles (DRPs) through information contained in the historical site assessment (HSA) and/or continued characterization.
- Section 3.2 further describes steps that can be taken to minimize the creation of DRP including the radiation control surveys needed to address control of DRPs.
- Section 4.5 describes how the presence of DRPs should be addressed as a part of remediation activities and how isolation and control measures can minimize the spread of DRPs.
- Section 5.1.3 describes how licensees have recently addressed, in their LTPs, how DRPs affect their Final Status Surveys.
- Appendix H provides detailed guidance on DRPs:
    - Minimization
    - Surveys and instrumentation
    - FSS and dose assessment

NOTE: NEI does not concur with the dose modelling and compliance approach presented in Draft DUWP-ISG-03, for the reasons stated in NEI letter dated 10.28.24.

2.9: In-Situ Gamma Spectroscopy

NRC Suggestion:

Section 2.2.1.4 of NEI 22-01 discusses the mathematical efficiencies that will be gained using a conservative model that will convert the identified spectrum peaks to activity per unit area (i.e., pCi/m^2) within the assumed geometry. The NRC staff notes that where in-situ gemma spectroscopy is to be used for final status survey, the analysis, conversion and interpretation of the results in terms of the derived concentrations guideline levels (DCGLs) should be proofed through the collection and analysis of actual soil samples of varying concentrations. Any such study and associated analysis procedure(s) should be reviewed with stakeholders and submitted to the NRC as part of the LTP.

2.9: In-Situ Gamma Spectroscopy (continued)

Industry Perspective: The following text has been added to NEI 22-01 Section 2.1.2 (next to last paragraph):

"The use of in situ gamma spectroscopy in place of scanning has been more widely used in decommissioning FSS as experience has grown. However, recognition of the following limitations should be considered. In-Situ Gamma Spectroscopy should not be considered where past remediation for DRPs or expectation for potential DRPs exist. Additionally, as indicated activity in a land area survey unit approaches the DCGL, complementary scanning and sampling should be considered. Examples of in situ gamma spectroscopy being used in place of conventional scanning are given in Appendix A."

Based on area characterization, the interpretation of In-Situ Gamma Spectroscopy data is expected to provide conservative results. Industry feels that sampling to support the use of In-Situ Gamma Spectroscopy is not needed.

2.20: Scan coverage Requirements (Section 5.2.1)

NRC Suggestion:

NEI 22-01 should cite MARSSIM Rev. 2 concerning scan coverage recommendations.

NEI Response:

MARSSIM, Rev 2, Table 5.5 does not agree with the following sections in MARSSIM Rev 2:

- Section 5.3.6.1 of Revision 2: *Scan-Only Surveys* states that: "*The percentages of Class 2 and Class 3 areas that should be scanned is 10 percent or the result of using Equation 5-10, whichever is larger*"
- Section 5.3.6.2 of Revision 2: Scanning and Sampling states that: "*The percentages of Class 2 or Class 3 areas are scanned according to Equation 5-10"*.

NRC Comment 2.20 (continued)

- NEI 22-01, Table 5.4 has been revised to use most conservative recommendations from the MARSSIM Table 5.5 and the two bullets on the previous slide

Current Table 5.5 from MARSSIM Rev 2

Table 5.5: Recommended Survey Coverage for Structures and Land Areas

Area Classification	Scanning and Direct Measurements and/or Sampling Survey		Scan-Only Survey
	Scanning	Direct Measurements or Samples)	Scanning
Class 1	100%	Number of data points from statistical tests (**Sections 5.3.3 and 5.3.4**); additional measurements may be necessary for small areas of elevated activity (**Section 5.3.5**)	100%
Class 2	10–100% Systematic and Judgment "Scan Area"= $\frac{(10-\Delta/\sigma)}{10} \times 100\%$	Number of data points from statistical tests (**Sections 5.3.3 and 5.3.4**)	10–100% Systematic and Judgment "Scan Area"= $\frac{(10-\Delta/\sigma)}{10} \times 100\%$
Class 3	Judgment	Number of data points from statistical tests (Sections 5.3.3 and 5.3.4)	"Scan Area"= $\frac{(10-\Delta/\sigma)}{10} \times 100\%$ Judgment

Abbreviation: Δ/σ represents the relative shift.

Conservative Differences between NEI 22-01, Table 5.4 and MARSSIM Rev 2, Table 5.5

Area Classifi-cation	Scanning and Direct Measurements and/or Sampling Survey		Scan-Only Survey
	Scanning	Direct Measurements or Samples	Scanning
Class 1	No Change	No Change	No Change
Class 2	No Change	No Change	10-100% systematic and Judgment "Scan Area" 10% or as calculated by: $\frac{(10-\Delta/\sigma)}{10} \times 100\%$ whichever is larger
Class 3	Judgment "Scan AREA" calculated by: $\frac{(10-\Delta/\sigma)}{10} \times 100\%$	No Change	10-100% Judgment "Scan Area" 10% or as calculated by: $\frac{(10-\Delta/\sigma)}{10} \times 100\%$ whichever is larger

2.23: Use of Soil or Concrete as Backfill

NRC Suggestion:

“NEI 22-01 should indicate that the added risk associated with reuse of impacted materials should be evaluated and added to the risk from other media including surface and subsurface soils; subsurface soils below an excavation or void space; remaining structures; and groundwater. For impacted areas, the dose contributions for ROCs that are below detection limits should also be considered in a conservative manner.”

Note: NRC response to comments on DUWP-ISG-02 indicate that if the materials were designated as impacted, surveyed and found to be nondetect, then NRC would review the minimum detectable concentrations (MDCs), which should be a small fraction of the DCGL, and assess the dose at the MDC.

2.23 Use of Soil or Concrete as Backfill (continued)

NEI Response:

NEI disagrees with the concept of assigning dose to ROCs that are below detection limits, for impacted materials.

MARSSIM 2.3.5 guidance is 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.”*

Accepted industry practice for radioactive effluents does not assign dose to radionuclides below detection limits. Furthermore, dose should not be assigned to materials from offsite that were not impacted by facility operation.

2.29: Zion Subsurface Soil FSS (Section 5.3.2.2, first paragraph)

NRC Suggestion

Section 5.3.2.2 of NEI 22-01 *(first paragraph)* discusses subsurface soil. This soil is referred to as “inaccessible soils” or “soils in inaccessible areas.” The NRC staff notes that the presence and handling of inaccessible soils is a very significant consideration in license termination and should be addressed in NEI 22-01. Include identification, communication with the regulator and stakeholders, documentation, and technical evaluation.

Changes to NEI 22-01 incorporate remainder of NRC suggestion 2.29

2.29: Zion Subsurface Soil FSS (Continued)

NEI Response:

- We see no mention of inaccessible soils or soils in inaccessible areas in Section 5.3.2.2.
- There is mention of inaccessible areas concerning soils in the following sections of NEI 22-01:
  - Section 2-1 Site Characterization: "*The characterization data includes survey results to include a discussion on … areas that were inaccessible during the initial site characterization, etc*."
    - **Added wording to this section in Rev 1 of NEI 22-01**: "*These areas should be characterized when they become accessible, or justification should be provided as to why they do not need to be surveyed."*
  - Appendix C, #151, Site Characterization: "*A discussion of why areas and surfaces did not need to be surveyed - for areas and surfaces that were considered to be inaccessible or not readily accessible"*
  - Appendix C, #274, Chapter 5, Final Radiation Survey Plan: "*For areas and surfaces that are inaccessible or not readily accessible, a discussion of how they were surveyed or why they did not need to be surveyed"*
- We feel that this change and other mentions in NEI 22-01 address this NRC comment. If not, please clarify the comment and/or which section of NEI 22-01 it refers to.

2.49: Parameter Sensitivity Analysis (6.1.2)

NRC Suggestion:

"NUREG-1757, Volume 2, Revision 2, Appendix I indicates that for risk-significant parameters additional support may be needed for deterministic values used in the compliance demonstration to ensure that the doses are not under-estimated (i.e., that the 25th or 75th percentile values may not be demonstrably conservative for broad parameter distributions such as distribution coefficients or K*d*s)…."

and…

"…NUREG-1757, Volume 2, Revision 2, provides acceptable methods for demonstrating that dose criteria are met through dose modeling to develop clean-up criteria (or DCGLs) and radiological survey to demonstrate mean or median concentrations in the survey unit are less than the release criteria while minimizing decision errors. Updating NEI-22-01 to clarify guidance found in NUREG-1757, Volume 2, Revision 2, regarding support for deterministic parameter values as stated above would be beneficial to licensees. Further, the NRC staff suggests that NEI cite the most recent data compilations available in the literature…"

2.49: Parameter Sensitivity Analysis (continued)

NEI Response (added to 6.1.2):

- “NUREG-1757, Volume 2, Revision 2, indicates that the RESRAD default parameter values are placeholders and should not be used without additional justification for risk-significant parameters identified during sensitivity analysis.”

- “Guidance on selection and defense of input parameters for dose modeling in NUREG-1757 notes that a licensee may use the parameter distribution for a physical parameter, provided it justifies why the parameter distribution is consistent with the site conditions, and that licenses may not use deterministic physical parameter values without substantial justification (including sensitivity and uncertainty analyses). Justification of physical parameter selection based on literature values can be complex, time consuming, and sometimes practically impossible. Parameter selection that is based on reliable site or regional data, or in some cases measurement, is preferred.”

2.49: Parameter Sensitivity Analysis (continued)

Industry Perspective:

- While industry understands the guidance in NUREG 1757, the need to perform a site-specific (and expensive) determination of Kd factors should be the exception and not the rule:
  - Minimal drinking water pathways (in reality) at decommissioning sites.
  - Where there are pathways, the resultant doses as compared to the 25mr/yr compliance goal are low.
  - There are multiple, compounding sources of conservatism in the assumptions underlying the dose models, ultimately leading to very conservative calculated doses for demonstrating compliance with 10 C FR 20 Subpart E. These conservatisms should adequately bound any uncertainties associated with the selection of Kd values.

2.54, #5: Zion Subsurface Soil FSS Section (5.3.2.2)

NRC Suggestion:

- “Section 2.3.3 states that the process for evaluating insignificant contributors needs to be described in the LTP but is not required to be analyzed during the FSS. However, NRC recommends that the initial suite of potential ROCs should be analyzed for during FSS in a typical quality assurance and quality control frequency as described in MARSSIM.”

NEI Response:

- Items attributed to MARSSIM were not found in MARSSIM *but*
- Relevant information from NUREG 1757, Rev 2 has been added to Section 2.5.3 follows:
  - **“**In general, the NRC does not require post-remediation sampling of the insignificant radionuclides, due to their low risk-significance. However, if there is a valid concern that the dose contributions of the postulated insignificant radionuclides could be significant following remediation, licensees may choose to manage this uncertainty as part of the DQO process (e.g., through post-remediation sampling of the insignificant radionuclides, similar to the approach used for surrogate radionuclides discussed in MARSSIM Section 4.3.2).”
- We feel that this change and other mentions in NEI 22-01 address this NRC comment.

Other Opportunities to Improve LTP Efficiency

- Allow a phased approach to site radiological characterization via “partial” LTP submittals that is synchronized with the physical decommissioning process.
  - Enables NRC acceptance reviews/approvals for LTPs earlier in the process.
  - Allows NRC to establish formal expectations for refinements to site characterization data throughout the project, via LTP revisions.

- Maintain an appropriate scope for environmental reviews consistent with the relatively limited impacts associated with decommissioning while maintaining conformance with NRC’s Decommissioning GEIS.

- Continue to find opportunities to risk inform the license termination process, particularly regarding parameter selection, evaluation of compliance scenarios, and application of the “less likely but plausible” criterion.

Next Steps?

Open Discussion