

# Efficiency Opportunity



December 4, 2019

Efficiency Opportunity: 19–RP–04

## On-Site Low Levels of Residual Radioactivity

Rely on decay for low levels of residual radioactivity in soil that are expected to be less than the unrestricted release criteria at the time of License Termination.

The process will allow licensees to make a radiological significance threshold determination for low levels of residual radioactivity, where the residual radioactivity does not challenge meeting the future license termination criterion of 10 CFR 20.1402 (25 mrem/yr) or state criterion for release.

---

**Issue:** **RP-25, On-Site Low Levels of Residual Radioactivity**

### Summary of Efficiency Opportunity

- Desired end-state—Materials such as soils, silt, sand, or excavated fill, with low concentrations of residual radioactivity from spills / leaks, dredged silt, etc., that are likely to be less than the 25 mrem/yr unrestricted release criteria (10CFR20.1402, *Radiological Criteria for Unrestricted Use*) at the end of the license, will be left in place for decay rather than excavated, containerized, and shipped to a licensed disposal site or waste processor. Overall risk and cost are minimized because the levels left in place (or moved to an alternate on-site location) are expected to meet the license termination criteria without remediation. Off-site transportation and disposal costs are avoided. This efficiency opportunity does not address residual radioactivity in structures and groundwater.
- Value proposition (vision of excellence)—This initiative reduces personnel and equipment safety risks; operating costs associated with residual radioactivity cleanup; transportation risk; and transportation and disposal cost. The initiative provides for better stewardship of existing low-level radioactive waste disposal sites by not adding unnecessary material to them. Savings estimates vary depending on the material that can be managed using these methods, as well as transportation, processing, labor, and disposal costs. This initiative will reduce the recurring costs to licensees who have historically made overly conservative decisions when low levels of residual radioactivity have been encountered through spills or identified during excavations. Without standard guidance (in the form of a procedure with soil concentration limits) licensees may mistakenly believe that soil outside the RCA needs to be free from licensed radioactivity, resulting in unnecessary and costly cleanup and disposal activities. [NISP-RP-800](#) has been developed to assist with the process.

## Relevant Standards

- Federal Register Volume 76, No. 117, Friday June 17, 2011, Pages 35512 - 35575, NRC, 10 CFR Parts 20, 30, 40, 50, 70, and 72, Decommissioning Planning.
- 10 CFR 20, Standards for Protection Against Radiation
- EPRI 1016764, Technical Guidance for Monitored Natural Attenuation, September 2008
- EPRI 1018724, Program on Technology Innovation: Economic Impacts of Compliance with dose Based Regulations for Selected Nuclear Power Plant Programs, April 2009
- EPRI 1021104, Groundwater and Soil Remediation Guidelines for Nuclear Power Plants, December 2010
- EPRI 3002000546, Groundwater Protection Guidelines for Nuclear Power Plants, Revision 1, October 2013
- EPRI 3002008167, Groundwater Monitoring Guidance for Decommissioning Planning, October 2016.
- NEI 07-07, Industry Ground Water Protection Initiative - Final Guidance Document, Revision 1 March 2019.
- NUREG -1757, Vol 2, Rev1, Consolidated Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria.

## Recommended Industry Actions

- Implement [NISP-RP-800](#) On-Site Low Levels of Residual Radioactivity, for this process.
- Each licensee may want to enhance the process for a site-specific program. The NISP supports options for fiscal and environmental responsibility with regards to residual radioactivity that is likely to meet decommissioning criteria at the time of license termination. The following guidance provides additional detail on programmatic considerations, process, decisions and actions:

### A. Considerations Upon Discovery of Residual Radioactivity:

1. The source of the contamination (example: leaking pipe, or tank) cannot be ignored and the expectation is that the leak will be stopped in a timely manner. FR Volume 76, No. 117, Friday June 17, 2011, Pages 35512 - 35575, requires licensees to conduct operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater.
2. The process must include consideration for tritium concentrations and other radionuclides if present, location of residual radioactivity, and an evaluation that material is not expected to migrate off site (beyond the site boundary) or impact groundwater.
3. The potential for migration of the residual radioactivity (e.g. a water source on top of the soil may establish a hydrostatic force and allow radioactivity to migrate) must be managed.

### B. Once the source of contamination is determined and any leaks addressed so that the production of the source term is stopped, the approach to leaving the material residual radioactivity in place on the licensee's site are described below:

1. Licensees may leave residual radioactivity in place, refill excavation locations, or move the material to another area (residual radioactivity must stay on-site in the Protected Area or Owner Controlled Area);
2. Soils found to contain residual radioactivity (in acceptably low concentrations) will be left in place and documented in the 50.75(g) decommissioning file;
3. Materials excavated may be placed back in the original excavation or placed in another location with a documented 50.75(g) file;
4. Soils with residual radioactivity which must be moved for site operations (for example excavation of soils for the addition of a building where soils will be moved to another site location) and documented in a 50.75(g) file;

5. The 50.75 (g) file must include: (1) a description of the residual radioactive material, (2) radionuclides, (3) radionuclide forms, (4) radioactivity concentration within the material, (5) total volume of the residual radioactive material, and (6) total activity of the material.
6. The total activity will determine additional controls that may be needed. Areas where licensed material exceeds greater than 10 times the quantity in 10 CFR 20 Appendix C shall be posted in accordance with 10 CFR 20. 1902, as "Caution Radioactive Material." Site procedures for establishing a Radioactive Material Area (RMA) will be followed.

**Notes:**

1. Large areas of very low concentrations may meet the quantity requiring posting as a Radioactive Material Area. However, these areas are expected to be released at the time of license termination (when all signs and postings will be removed).
2. Simple erosion control means such as planting grass should be considered when leaving the material in place. Contaminant migration is expected to be minimal for particulate radionuclides but care should be taken to ensure migration to an offsite location does not occur. (Groundwater tritium migration is known and monitored). Surface soils at low residual radioactivity present a much lower risk for migration off site but conditions which could lead to dose to a member of the public should be minimized/avoided.

**Change Management Considerations**

- NEI staff to discuss the bases and direction of this efficiency opportunity and NISP with the NRC's NRR personnel, as appropriate.

*Company Actions*

- Ensure a complete and accurate 50.75(g) documentation program is in place.
- Ensure any area where residual radioactivity will remain is within the area defined in the ANI nuclear liability insurance site description.
- Review the Site FSAR/USAR to ensure there are no limitations for the proposed actions.
- Review [NISP-RP-800](#) for site applicability and adopt or modify as needed.
- Establish a program for making decisions when material is found to contain residual radioactive material. Use the attached guidance as a starting point. This will ensure that decisions can be made in a timely manner so that production of site projects are not impacted.

*Guidelines*

- Depending on the location and the amount of residual radioactivity, a licensee may perform periodic confirmatory sampling to ensure the material has not migrated to areas not documented.
- Soil placement in a new location should not impact groundwater or create a new plume of contaminated groundwater in that location. Evaluations should be performed to determine radionuclide transportability prior to soil placement in a new location.

**Industry Review:**

**Radiation Safety Task Force**

**Betsy Langille, EO Developer**

**Phung Tran EPRI, Rich McGrath EPRI**

**Matthew Kerns, Institute of Nuclear Power Operations**

**Ellen Anderson, Nuclear Energy Institute**