

Building and Site Release and Use

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The current U.S. Nuclear Regulatory Commission (NRC) site release criteria, the License Termination Rule (LTR), went into effect on July 21, 1997. The LTR, located in Subpart E of 10 CFR Part 20 (see <http://www.nrc.gov/reading-rm/doc-collections/cfr/>), provides dose-based criteria for the release of sites for either unrestricted or restricted use. This paper discusses the LTR and dose modeling and survey techniques employed to demonstrate LTR compliance.

I. Release Standards

Prior to 1997, NRC licensees were required to meet the criteria provided in the “Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites” (SDMP Action Plan), located in 57 FR 13389. The 1992 SDMP Action Plan consolidated existing criteria and guidance on license termination (e.g., the 1981 NRC Technical Position “Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations” and Regulatory Guide 1.86, “Termination of Operating Licenses for Nuclear Reactors”). Under the SDMP Action Plan, sites were remediated to concentration-based criteria, which varied for different radionuclides. Furthermore, remediation generally included the use of different criteria/guidance for different media. For example, a “typical” uranium and thorium contaminated facility would have used the surface contamination criteria in Regulatory Guide 1.86 for release of buildings and equipment, while applying the soil concentration criteria from the 1981 Technical Position for remediation of outdoor areas.

In order to provide for more efficient use of NRC and licensee resources, to facilitate consistent cleanup across all types of licensees, and to create a predictable basis for decommissioning planning, the NRC developed and codified the dose-based LTR. The LTR encompasses cleanup of all of the media (i.e., soil, buildings, and groundwater) and radionuclides at a site, and provides two release options.

A. Unrestricted Use

The LTR provides for the termination of the NRC license and release of a site for unrestricted use, if the criteria in 10 CFR 20.1402 are met. For unrestricted release a licensee must demonstrate that the residual radioactivity (i.e., from all NRC regulated

radionuclides and from all media) results in a total effective dose equivalent to an average member of a critical group that does not exceed 0.25 milliSievert per year (mSv/yr). Furthermore, the regulation provides that licensees must also demonstrate that the residual radioactivity at the site has been reduced to levels that are as low as is reasonably achievable (ALARA).

B. Restricted Use

In addition to unrestricted use criteria, the LTR also provides for license termination under restricted conditions. The LTR generally provides that license termination can be achieved if a licensee demonstrates that the dose to an average member of the critical group would not exceed the unrestricted use dose criterion, with restrictions in place (e.g., engineered barriers, institutional controls), and would not be higher than 1 mSv/yr if those restrictions were to fail.

II. Demonstrating Compliance

A. Dose Modeling

Dose modeling is almost always necessary for licensees to demonstrate compliance with the LTR. Additionally, dose modeling is a tool used by the NRC staff in reviewing licensee submittals. NRC's review plan for materials decommissioning (NUREG-1727, available at <https://www.ornl.gov/PTP/pdf/1727.pdf>) contains the methodology employed by NRC staff when evaluating licensee submittals, and also includes guidance and references on dose modeling in general. In summary, NRC's review process includes an assessment of: 1) source term assumptions; 2) the exposure scenario; 3) the mathematical model/computational method used; and, 4) the parameter values and their uncertainty. While a number of computer codes are available for dose modeling, licensees and NRC staff commonly use RESRAD and DandD. Information and a downloadable version of RESRAD are available at: <http://web.ead.anl.gov/resrad/home2/index.cfm>. Information regarding DandD is available on NRC's website at: <http://www.nrc.gov/what-we-do/regulatory/research/comp-codes.html#rt-dc>.

B. Surveys

Similar to dose modeling, it is necessary for licensees to perform surveys to demonstrate compliance with the LTR. While the LTR is dose-based, compliance is still based on demonstrating that the concentrations of radionuclides at licensed facilities are reduced to appropriate levels. Specifically, NRC guidance requests that licensees develop and demonstrate compliance with derived concentration guideline levels (DCGLs), which are concentration equivalents to the dose requirement, derived through dose modeling.

Prior to 1997 NRC's primary guidance document for final status surveys was NUREG/CR-5849: Manual for Conducting Radiological Surveys in Support of License

Termination. This was a prescriptive methodology, which was designed for demonstrating compliance with concentration-based criteria. In 1997, NRC in cooperation with the U.S. Environmental Protection Agency, the U.S. Department of Defense, the U.S. Department of Energy, and other agencies on a multi-agency working group, developed the Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM). MARSSIM is a performance based survey methodology, which is designed for conducting surveys to demonstrate compliance with dose- and risk-based criteria, rather than concentration-based standards. The MARSSIM document and information regarding the methodology are available at: <http://www.epa.gov/radiation/marssim/>.

III. Ongoing Challenges

Implementation of the LTR has created several challenges to NRC as a regulating agency. These challenges include: dose modeling (e.g., developing and modeling adequate future use scenarios); additional cleanup standards by States and other Federal agencies; clearance (e.g., what is the appropriate pre-license termination criteria for release of material for decommissioning sites); and making the LTR's restricted release option viable (e.g., solving the problem of how to provide for the long-term custodianship of restricted use sites).

NRC is making steady progress in resolving many of these challenges facing the U.S. decommissioning industry and the American public. Participation in the international decommissioning community, through meetings such as this, offer us the opportunity to learn how other nations and regulatory agencies have addressed similar challenges.