

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

May 28, 2004

**NRC REGULATORY ISSUE SUMMARY 2004-08
RESULTS OF THE LICENSE TERMINATION RULE ANALYSIS**

ADDRESSEES

All holders of operating licenses for nuclear power reactors, research and test reactors, as well as decommissioning sites.

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to inform addressees of: NRC's analysis of issues associated with implementing NRC's License Termination Rule (LTR), the Commission's direction to date on how they can be addressed; schedule for future actions; and opportunities for stakeholder comment. No specific action nor written response is required.

BACKGROUND

NRC staff experience with the LTR has revealed some important implementation issues impacting the decommissioning of sites. The Commission directed the staff, in June 2002, to conduct an analysis of LTR issues, with particular emphasis on resolving the restricted release and institutional control issues with the goal of making the LTR provisions for restricted release and alternate criteria in 10 CFR 20 Subpart E more available for licensee use. On October 1, 2002, the staff provided the Commission with an initial analysis that described the scope of each issue and the staff's plans for evaluation (SECY-02-0177). The staff's analysis and recommendations for eight issues were provided to the Commission on May 2, 2003 (SECY-03-0069), and the Commission approved the staff's recommendations with comments on November 17, 2003. Subsequently, on March 1, 2004, the staff provided the Commission with its analysis of a ninth issue on intentional mixing (SECY-04-0035), and the Commission approved the staff's recommendation, with comments on May 11, 2004. Both of these Commission papers are available to the public on NRC's web site.

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SUMMARY OF ISSUES

The nine issues that the staff analyzed are listed below, and the results of these analyses are summarized in Attachment 1 to this RIS along with the Commission's directions to the staff.

1. **Restricted release/alternate criteria and institutional controls:** NRC licensees have difficulties arranging the institutional controls, required by the LTR, that will ensure long-term protection of public health and safety.
2. **Relationship between LTR release criteria and the unimportant quantities criterion under 10 CFR 40.13(a):** The relationship is unclear between the exemption in 10 CFR 40.13(a) for source material that is less than 0.05 weight percent uranium or thorium, and the criteria in 10 CFR 20 Subpart E (LTR), which is used for decommissioning and license termination. In addition, clarification is needed that 10 CFR 40.13(a) is not a decommissioning criterion.
3. **Appropriateness of developing a separate uranium/thorium unrestricted release standard:** Because LTR cleanup levels can be below concentration levels found in nature, the appropriateness of developing an unrestricted release standard higher than the LTR should be considered. In addition, LTR cleanup levels can be lower than other NRC regulations or certain State and Federal regulations, and some sites have large volumes of source material, making their cleanup complex and costly.
4. **Relationship between the LTR and on-site disposal under 10 CFR 20.2002:** NRC regulations do not establish a clear standard for approving on-site disposals, although on-site disposals need to be reconsidered under the LTR at the time of license termination.
5. **Relationship between the LTR and the current case-by-case approach for controlling the disposition of solid materials:** The relationship is unclear between the LTR's dose constraint of 0.25 milliSievert per year (mSv/yr) [25 millirem per year (mrem/yr)] for unrestricted use of a site, and existing guidance for controlling the disposition of solid materials on a case-by-case basis, particularly for instances where materials and equipment containing residual contamination might be removed from an unrestricted-use site after license termination.
6. **Realistic exposure scenarios:** Clear guidance is needed for selecting more realistic exposure scenarios to estimate potential doses to the public after termination of the license.
7. **Measures to prevent future legacy sites by changes in financial assurance:** Because licensee financial assurance risks may cause shortfalls in decommissioning funding, additional measures are needed to ensure that adequate funds are available to decommission sites.

8. **Measures to prevent future legacy sites by changes to licensee operations:** Because licensee operational risks may cause decommissioning problems, additional measures are needed to minimize or mitigate the potential for future problems.
9. **Appropriateness of allowing intentional mixing of contaminated soil:** The appropriateness of allowing intentional mixing of contaminated soil to meet release criteria should be evaluated.

FUTURE ACTIONS

In SRM-SECY-03-0069, the Commission approved the following four actions:

- (1) RIS: Prepare a RIS to inform a wide range of stakeholders about the LTR analysis of each issue, Commission direction, and planned future actions.
- (2) Rulemaking: Conduct a new rulemaking to examine adding and revising requirements for: a) financial assurance, and b) licensee operations, including monitoring, reporting, and remediating to reduce the potential for future legacy sites. This single rulemaking would consider the approved options and associated Commission comments.
- (3) Guidance: Develop new guidance to implement the above rulemaking and revise existing guidance to address approved options for restricted release, on-site disposal, selecting realistic land use scenarios, and use of intentional mixing. Guidance would incorporate Commission comments.
- (4) Inspection and Enforcement Guidance: Revise the existing inspection and enforcement guidance to enhance monitoring, reporting, and remediation, to prevent future legacy sites.

The general schedule for the future actions is given below.

New rulemaking to prevent future legacy sites	
Proposed Rule	9/30/06
Final Rule	9/30/07
New guidance (supporting new rule)	
Draft	9/30/06
Final	9/30/07
Revised Guidance	
Draft	9/30/05
Final	9/30/06
Revised inspection/enforcement guidance	9/30/05

This schedule provides two opportunities for formal stakeholder comments. In September 2005 the staff plans on publishing draft revised guidance regarding options for restricted release, on-site disposal, selecting realistic land use scenarios, and the use of intentional mixing of soil. The staff's normal guidance development process would be used, which includes providing

draft guidance for public comment. Thus, stakeholder involvement would be an important part of developing the guidance. The staff also plans on requesting public comment, in September 2006, on the proposed rule and supporting draft guidance for financial assurance and facility operational changes, to prevent future legacy sites.

SMALL BUSINESS REGULATORY ENFORCEMENT FAIRNESS ACT OF 1996

The NRC has determined that this action is not subject to the Small Business Regulatory Enforcement Fairness Act of 1996.

This RIS requires no specific action nor written response. If you have feedback or questions about this matter, please provide them to the technical contact listed below.

/RA/

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Attachment:

1. Summary of License Termination Rule Analysis
2. List of Recently Issued NRC Regulatory Issue Summaries

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SUMMARY OF LICENSE TERMINATION RULE ANALYSIS

The staff's analyses of License Termination Rule (LTR) implementation issues considered a wide range of relevant information and experience from other U.S. Nuclear Regulatory Commission (NRC) programs and regulations, as well as external sources, such as the U.S. Environmental Protection Agency (EPA); U.S. Department of Energy (DOE); Agreement States; and National Research Council reports. Similarly, NRC staff carefully coordinated their analyses to gain further information and perspective, as well as to identify interrelationships among the individual issues.

The staff's analyses also identified options to resolve the issues, evaluated their pros and cons, and used these results to recommend specific options to the Commission. The full range of regulatory actions and products to implement the options was considered, including: rulemaking; guidance; inspection procedures; enforcement guidance; and informational tools such as a Regulatory Issue Summary (RIS).

Staff analyses of options, recommendations to the Commission, and Commission directions for the nine issues are summarized below. Additional information for each of the nine issues is given in SECY-03-0069 and SECY-04-0035. Both these documents are available on NRC's web site.

1. Summary of Issues

a. Restricted Release/Alternate Criteria and Institutional Controls

Institutional control requirements that are necessary for the viability of both the restricted release and alternate criteria provisions of the LTR (i.e., 10 CFR 20.1403 and 1404, respectively) have been difficult for licensees to implement, particularly for those sites contaminated with long-lived radionuclides such as uranium and thorium. Although only a few NRC decommissioning sites are considering restricted release at this time, resolving this issue, so that the restricted release provision is more viable, may allow decommissioning progress at these few sites. At this time no sites are considering license termination using alternate criteria.

The staff evaluated information and experience from other NRC regulations, EPA, DOE, Agreement States, National Research Council reports, and an American Society for Testing Materials (ASTM) standard, to gain insights about how others are addressing this issue.

The staff also evaluated several options, including those directed by the Commission, and offered several recommendations. Recommendations were made, to clarify the LTR's risk-informed and graded approach, which describes a framework for identifying lower-risk and higher-risk sites and the appropriate type of institutional controls for each (see Table 1). The graded approach was developed using the dose criteria from the LTR and information from the LTR "Statements of Considerations." Therefore, the risk-informed and performance-based concept, as applied to institutional controls, is not new, but the recommended clarification option further develops and explains the framework and implementation.

Other recommendations were made to clarify how existing options for institutional controls can be used more effectively over long time periods, such as layering multiple types of institutional controls (e.g., deed restrictions, together with zoning). In addition, two new options were recommended for NRC long-term oversight. One of these options involves NRC monitoring and, if necessary, enforcing institutional controls after license termination, using a legal agreement and a deed restriction. This option evolved from a similar approach that the Commission approved for uranium mill tailings sites under the Uranium Mill Tailing Radiation Control Act (UMTRCA) for private property adjacent to DOE-owned and -controlled sites.

The other option is a possession-only specific license (currently referred to as a Long-Term Control possession-only license) for the time period restrictions are needed. Under this option, after remediation is completed, the NRC license would be amended to include specific conditions to restrict site access and land use, together with conditions for routine maintenance and monitoring, as appropriate. This option is similar to the general license that has been in use for over 10 years for uranium mill tailings sites under UMTRCA, where DOE is the licensee that provides the surveillance and controls. Finally, it should be noted that these two new options are different than the original LTR concept that license termination was expected to have finality and that absent significant threats to public health and safety, NRC would no longer have an oversight role. For those few restricted use sites that cannot arrange acceptable institutional controls, the existing license would be amended to become a Long-Term Control license, which would provide the legally enforceable and, if needed, durable institutional controls.

The staff's future actions are:

1. Beginning in fiscal year (FY) 2004 the staff will implement the approved options;
2. During FY 2005-FY 2006, the staff will develop revised guidance that will be included in future revisions to the Nuclear Material Safety and Safeguards (NMSS) Consolidated Decommissioning Guidance in NUREG-1757. During this process there will be a formal request for public comment on the draft guidance as the Commission directed. These comments will be shared with the Commission before issuing final guidance.

b. Relationship between LTR Release Limits and other Release Limits

The following four issues are included under this broader issue.

Unimportant Quantities Under 10 CFR 40.13(a)

This issue addresses the unclear relationship and potential inconsistency between the LTR and the unimportant quantity limit for source material in 10 CFR 40.13(a). This issue was first raised by the owner of a formerly licensed NRC site who requested to use 10 CFR 40.13(a) as its decommissioning criteria. The Commission did not approve the specific request for the site. The staff evaluated the issue in general, and the Commission approved the staff's recommendation, which is summarized below. No further action is planned for this issue.

10 CFR 40.13(a) exempts any person from NRC regulations to the extent that the person receives, possesses, uses, transfers, or delivers matter containing less than 0.05 percent by weight source material. This provision stems from regulations adopted approximately 40 years ago, and the 0.05 weight percent appears to have been chosen on the basis of the concentration of source material that is necessary to be a useful source of fissionable material. The 0.05 weight percent defines a criterion for entry into NRC regulation. In contrast, the LTR contains the license termination criteria for facilities leaving NRC regulation after decommissioning. 10 CFR 40.42(k) specifies the determinations that the Commission must make to terminate a source material license. These determinations include a demonstration that the site is suitable for release in accordance with the criteria in the LTR. Therefore, it is NRC's policy that 10 CFR 40.13(a) is not to be used as a decommissioning criterion.

Appropriateness of Developing a Separate Uranium/Thorium Unrestricted Release Standard

This issue addresses the appropriateness of developing a separate uranium/thorium (source material) unrestricted release standard at levels higher than those in the LTR under 10 CFR 20.1402. The issue was evaluated because: 1) source-material licensees are currently required to clean up sites where source material was used to levels that are potentially below levels that exist elsewhere in nature; 2) the unrestricted release standard in the LTR is, in some cases, lower than other NRC regulations dealing with remediation and unrestricted use of uranium and thorium, State and Federal regulations for technologically enhanced naturally occurring radioactive material (TENORM), and recommendations of the International Commission on Radiological Protection (ICRP); and 3) some of these sites have large volumes of source material, making the cleanups both complex and costly—and, in some cases, threatening to force the owners to bankruptcy.

The staff examined a number of existing regulations and policies to determine the relationship and consistency between the release criteria in the LTR and other regulations pertaining to the unrestricted use of source material. The staff evaluated regulations and policies used by NRC, other federal and state agencies, and international organizations related to uranium and thorium. The staff also considered a number of other items that could influence both the viability and necessity to develop a separate unrestricted release standard for source material. These items include the number of licensees that would be impacted; ongoing activities that might affect the future number of source material licensees; the use of existing regulations to reach the goal of allowing licensees to clean up safely at reasonable cost; differences between source material and other radioactive materials; and the possible impacts from having a separate standard.

The staff determined that there are only a limited number of existing source material sites that have not already sought unrestricted release and may find it necessary to clean up to requirements other than those in 10 CFR 20.1402. The staff concluded that the LTR provides complex source material sites the flexibility to use a graded approach (unrestricted use to restricted use to alternate criteria) that can be based on risk. Use of the LTR at these sites would maintain 10 CFR 20.1402 as an unrestricted release standard for source material sites that are not so complex, so that public confidence is not impacted. Based on the flexibility in the existing regulations in 10 CFR 20.1402, 20.1403, and 20.1404, and because

of the limited number of sites that may require cleanup to criteria other than those in 10 CFR 20.1402, the staff recommended and the Commission approved not developing a separate unrestricted release standard for source material licensees at this time. Therefore, no further actions are planned.

On-Site Disposal Under 10 CFR 20.2002

This issue addresses the fact that 10 CFR 20.2002 does not establish a clear standard for approving on-site disposals, but allows Agency discretion to approve such disposals, on a case-by-case basis, as long as the action remains below the public dose limit of 1 mSv/yr (100 mrem/yr). However, the LTR requires that the contribution to the dose from on-site disposals are to be considered at the time of license termination. In addition, the requirements of the Timeliness Rule in 10 CFR 30.36, 40.42, and 70.38 apply to on-site disposals and warrant assessment. This suggests that, at a minimum, the LTR constraint of 0.25 mSv/yr (25 mrem/yr), and ALARA for unrestricted release, should be used for approval of on-site disposals during operation.

10 CFR 20.2002 does not establish a specific standard for approving on-site disposal requests. Staff's current practice is to approve on-site disposal based on a criterion of a "few millirem". The Timeliness Rule requires decommissioning of buildings and outdoor areas that have been unused for a period of 24 months at facilities licensed under 10 CFR Parts 30, 40, and 70. The Timeliness Rule does not apply to facilities licensed under 10 CFR Part 50. Furthermore, the rule provides that "...storage during which no licensed material is accessed for use or disposal...are not principal activities." Although, NRC's regulations and the "Statement of Considerations" for the Timeliness Rule, do not explicitly address application of the rule to on-site disposals, NRC has consistently interpreted the LTR to include on-site disposals. Specifically, inactive on-site disposals are areas where no principal activities are occurring.

The staff recommended continuing the current practice of approving on-site disposals based on a dose criterion of a "few millirem." This is consistent with staff's goal of preventing future legacy sites, and not unnecessarily creating restricted release sites. The staff also recommended permitting burial requests with a dose criterion of 1 mSv/yr (100 mrem/yr), as long as such requests are approved contingent on providing additional financial assurance to cover the cost of decommissioning the burial site for license termination. The additional financial assurance satisfies staff's concern with preventing future legacy sites, while providing licensees with maximum flexibility under the existing regulation. Finally, the staff recommended implementing this option with revised guidance.

The Commission approved the staff's recommendations and requested that the staff add a third option to allow that if the material to be disposed of on-site is mainly short-lived that will significantly decay in a few years, then the staff could approve on-site disposal with a maximum dose rate of 0.25 mSv/yr (25 mrem/yr) without requiring additional financial assurance for license termination so long as the likelihood of creating a legacy site is low (e.g., license termination is not imminent).

The staff's future actions are:

1. Beginning in FY 2004, the staff will implement the approved options with licensees who request approvals of or consultations about on-site disposals;
2. During FY 2005-FY 2006, the staff will develop revised guidance that will be included in future revisions to the NMSS Consolidated Decommissioning Guidance in NUREG-1757. During this process there will be a formal request for public comment on the draft guidance.

Controlling the Disposition of Solid Materials

This issue addresses the unclear relationship between the LTR's dose constraint of 25 mrem/yr and ALARA for unrestricted use of a site, and existing guidance for controlling the disposition of solid materials (CDSM) on a case-by-case basis, particularly for instances where residual contamination might be removed from an unrestricted-use site after license termination. Such material could be removed because the site's license would have been terminated based on meeting the 25 mrem/yr dose constraint of the LTR for unrestricted use. However, before license termination, material can not be removed from the site unless it meets the few mrem/yr criterion for the case-by-case CDSM guidance.

The LTR and the case-by-case approach for CDSM have different regulatory purposes and scopes. The LTR established radiological criteria for decommissioning, and focuses on protection of persons entering the site after a license is terminated. In contrast to the LTR, the existing case-by-case approach to CDSM is used before license termination, both during facility operations and during decommissioning, to protect persons from radioactive material leaving the site.

The differences in scope and timing between the case-by-case approach and the LTR result in different types of materials that could be removed from the site either before or after license termination. During facility operations, solid material, such as lumber; roofing material; metals, such as I-beams, rebar, service, and processing equipment; concrete in walls, floors, ceilings, or rubble; and soils, can be released after building renovation or demolition. Larger amounts of these types of material may be released during the decommissioning phase, as the facility is prepared for license termination. However, after license termination, the amounts and characteristics, including the residual radioactivity, of the materials that are present at a site and that could be removed have changed. Typically, the materials that remain include only lands and building structures, including equipment that is fixed in a room, such as ductwork and embedded piping. It is expected that items that can be removed readily from a room, such as pumps, valves, tables, desks, or processing equipment, would not be present after license termination, and therefore, would not be available for future removal from the site.

There are also differences in the assessment of potential future uses of a site. Under the LTR, as part of the license termination process, residual radioactivity in materials present at the site at the time of license termination are evaluated to ensure compliance with the dose constraint of 0.25 mSv/yr (25 mrem/yr). However, licensees, typically do not evaluate these materials for potential future use at off-site locations, nor does the LTR require such evaluation in the case of unrestricted release of a site. The two on-site exposure scenarios

that are typically used for demonstrating compliance with the dose constraint have been considered sufficiently conservative and, therefore, protective of public health and safety and the environment from potential off-site releases after license termination. In comparison, the current case-by-case approach for CDSM requires an evaluation of the radiological characteristics of the material before release. The material releases before license termination are evaluated using surveys of materials or specific evaluations of potential off-site doses from volumetric contamination. After license termination, there is no current provision for regulating removal of any material off site.

Radiological criteria and dose modeling are also different under the LTR than under the case-by-case approach. Under the LTR, for all solid material with residual radioactivity that remains at the site after the license is terminated, a dose assessment is performed to ensure compliance with the dose constraint in the LTR of 0.25 mSv/yr (25 mrem/yr) and demonstration that the residual contamination levels are ALARA. This determination addresses all pathways for residual radioactivity resulting from the site operations, including ground-water transport of radioactivity off site. A licensee can either use conservative default scenarios for on-site use or site-specific models with more realistic scenarios. For the more realistic site-specific approach, the critical group may not exist on-site, but may be a future user of materials removed from the site after the license is terminated. Unlike the radiological criteria required by the LTR, there are no specific requirements for the release of solid materials with small or no amounts of radioactivity. Absent such requirements, NRC evaluates the disposition of volumetrically contaminated solid materials before license termination on a case-by-case basis assessment of likely scenarios, using a criterion of a "few mrem/yr." In accordance with Commission direction, the staff is developing technical information in support of a rulemaking that could eventually establish requirements in this area. This lower dose level accounts for multiple releases of materials and equipment that may occur over the operating and decommissioning phases of a license. Furthermore, the materials and equipment may have intrinsic value, which leads to more diverse scenarios for reuse. In contrast, the release of lands and structures under the LTR accounts for a single, and most likely larger, release of material for unrestricted use at the time of license termination. An additional consideration is that equipment and materials may only be superficially contaminated. In such cases, current NRC survey guidance provides licensees with acceptable measurement protocols and concentration criteria for release of such materials before or during decommissioning.

The staff also evaluated factors that realistically would reduce the dose below 0.25 mSv/yr (25 mrem/yr) if material were removed from an unrestricted use site after the license is terminated. Staff experience indicates that applying the ALARA requirement effectively reduces the amount of residual radioactivity remaining at the time of license termination. In addition, certain decontamination practices such as removing layers of concrete by scabbling can further reduce the residual radioactivity to levels much lower than the LTR dose constraint, because the depth of scabbling is usually deeper than that needed to comply with the 0.25 mSv/yr (25 mrem/yr) constraint. Another practice used at some sites is reliance on residual radioactivity levels well below the dose constraint to increase statistical confidence in final radiological status surveys and reduce the survey costs. Finally, the removal of material from the site will include mixing with material that has very little or no residual radioactivity. Further mixing would occur where this material is finally disposed of. Such mixing would result in significant dilution in the residual radioactivity that would be removed from the site.

The staff's qualitative judgment is that the LTR is protective of public health if materials are removed from a site after license termination for unrestricted use, mainly because of the conservatism in the LTR technical basis and current dose-modeling assumptions, ALARA considerations; routine decontamination practices, and the effects of mixing when residual radioactivity is moved to other locations.

The Commission approved the staff's recommendation to discuss this issues in a RIS, but commented that when developing the RIS, the staff needed to provide some additional detail, not contained in SECY-03-0069, which describes the conservatism in the license termination analysis related to off-site removal of the material after license termination and how it may be possible to reduce some of the conservatism and still retain adequate assurance of protection of public health and safety with the unrestricted use of the material. The additional detail requested by the Commission is provided in the following discussion.

The conservatism in the license termination analysis refers to the use of relatively conservative default scenarios, such as an on-site resident farmer scenario. It is possible to reduce this conservatism by selecting more realistic exposure scenarios as, discussed in Section c below. However, when less conservative and more realistic exposure scenarios are selected, these may no longer bound the off-site use scenario. Licensees typically do not evaluate potential off-site future use scenarios, such as removal of soil for fill material or road base. Thus, the more realistic scenario option should also consider if off-site uses are determined to be reasonably foreseeable. If they are, they should also be analyzed to determine if the critical group might be an off-site user instead of an on-site user. Furthermore, even if off-site use is not considered reasonably foreseeable, these scenarios could be analyzed as alternate and less likely scenarios, to understand the robustness of the analysis. Both approaches would provide assurance of the protection of public health and safety when using the more realistic scenario option. As an additional implementation action, this clarification will be included in the staff's revised guidance for more realistic exposure scenarios. No other implementation actions are currently planned.

c. Realistic Exposure Scenarios

Staff and licensee experience implementing the LTR has raised questions about perceived unnecessary conservatism in dose assessments. One significant source of potential conservatism is with selecting post-license termination land use scenarios. This issue focuses on how to select and justify land use scenarios for the 1000-year dose assessment time period for both the unrestricted release cases and restricted release (assuming failure of institutional controls), and whether more realistic scenarios can result.

The staff evaluated NRC's existing guidance; licensee and staff experience using this guidance; case studies that have resulted in selecting more realistic scenarios; and EPA approaches. The staff recommended allowing justification of scenarios based on reasonably foreseeable future land use, as opposed to defaulting to very conservative scenarios such as the resident farmer. This includes identifying reasonably foreseeable land use scenarios that are likely within the foreseeable future (e.g., the next few decades and to possibly 100 years), considering advice from land use planners and stakeholders. This option would also identify less likely, alternate scenarios to the reasonably foreseeable scenarios, to understand the robustness of the analysis. Compliance would be based on a range of reasonably foreseeable scenarios, but evaluating less likely alternate scenarios would

provide information to reach a risk-informed decision. This option is consistent with the LTR critical group concept. The Commission approved the staff's recommendation, and NRC's future actions are:

1. Beginning in FY 2004, the staff will implement the approved option;
2. During FY 2005-FY 2006, the staff will develop revised guidance that will be included in future revisions to the NMSS Consolidated Decommissioning Guidance in NUREG-1757. During this process there will be a formal request for public comment on the draft guidance.

d. Measures to Prevent Future Legacy Sites

Many of the existing decommissioning sites that NRC regulates are complex and difficult to decommission for a variety of financial, technical, or programmatic reasons. These sites can be thought of as NRC "legacy" sites—those sites where past financial or operational events have created the existing problems that must now be overcome, to conduct sufficient cleanup and ultimately complete decommissioning and license termination. NRC evaluated the lessons from these existing legacy sites and plans on changes to financial assurance and licensee operational requirements to minimize or prevent future legacy sites.

Changes to Financial Assurance. A number of sites licensed before the financial assurance regulations were issued in 1988 now find that the full cost of decommissioning exceeds their projections and fund balances. Furthermore, staff experience applying the financial assurance regulations has resulted in many lessons that can be applied to improve the regulations and reduce the risks to decommissioning financial assurance. Based on this experience, the staff identified specific risks that could cause shortfalls in decommissioning funding including: 1) underestimation of decommissioning costs caused by a restricted release assumption; 2) operational indicators of increasing costs; 3) unavailability of funds in bankruptcy; 4) inadequate financial disclosure; 5) reaching assets after corporate reorganization; 6) investment losses reducing trust account balances; and 7) increased decommissioning cost because of accidental release.

For each of these funding risks, the staff evaluated options and made recommendations for both existing and future licensees. To resolve the risk of underestimating decommissioning costs, the staff recommends requiring a licensee to either: 1) obtain NRC approval of the decommissioning funding plan and prepare a cost estimate and financial assurance amount assuming unrestricted release or 2) demonstrate its ability to meet the restricted release requirements. The staff also recommends using a risk-informed approach to identify high-risk operational indicators (e.g., spills, groundwater contamination, and facility modification) and requiring updates to decommissioning cost estimates and financial assurance coverage. New requirements are recommended for additional certification of financial statements; holding both parent company and subsidiaries liable for decommissioning costs by license conditions and/or agreements; and for licensees to perform periodic evaluations of the impact of investment losses on their trust fund balances and sufficiency of financial assurance coverage. The staff recommended conducting a new rulemaking and developing new guidance.

The Commission approved the staff's recommendations for changes in financial assurance, but with the following comments:

- Changes in financial assurance requirements must be carefully coordinated among the Office of Nuclear Reactor Regulation, NMSS, and the Office of the General Counsel to ensure there are consistent standards being applied across the Agency.
- The staff should develop options for existing licensees to develop a decommissioning funding plan based on restricted release only if they can reasonably demonstrate that restricted release is viable for the site. For new licensees, the preferred decommissioning plan should be for unrestricted release, but the final regulations should allow for the potential of restricted release in the event of unusual circumstances (i.e., a major incident resulting in a significant environmental impact) or a determination that the facility is needed in the national interest.
- With respect to the unavailability of funds in bankruptcy where financial assurance is provided by a parent company or through self-guarantee, the staff will need to document more than just a general concern to justify significant regulatory changes in this area.
- Any regulatory change to address investment losses in trust account balances must be carefully worded so that it focuses on long-term market changes and not short-term changes or seasonal adjustments. Public comments in this area will be important, to properly focus the regulation so that it does not cause unnecessary recalculations of funds needed for decommissioning, but will trigger action when appropriate.
- Finally, the Commission has not objected to the staff developing a proposed rule related to property damage coverage for accidental release and publishing it for public comment, but the Commission intends to reserve final judgment on this issue until after review of the public comments.

NRC's future actions are:

1. During FY 2005-2006 develop a proposed rule and supporting draft guidance on changes to prevent future legacy sites and publish these documents for public comment;
2. During FY 2007, complete the final rule and supporting final guidance.

Changes to Licensee Operations. NRC also evaluated the lessons-learned from decommissioning existing contaminated sites and identified specific risks, during facility operations, that could eventually lead to sites with decommissioning problems. NRC concluded that chronic releases and reporting deficiencies were two key operational risks. Facilities that process large quantities of material, especially in liquid form, have the potential for significant environmental contamination. These facilities often have limited controls on spills to minimize costs and maximize profit. Furthermore, because of increasing disposal costs, some facilities may rely on storing waste, perhaps in settling ponds, rather than in

shipping waste to minimize on-site storage. NRC experience has shown that these operating conditions can lead to large amounts of chemical and long-lived radioactive contamination being released to the subsurface environment over an extended period of time. In addition, past regulatory oversight of processors of licensed material where there was no potential for nuclear criticality has historically been limited. This has allowed less serious, but, in some cases, chronic, operational weaknesses to go unreported. The result has been low-level, but long-term, releases of radioactive material to the subsurface environment. Often, because of these past reporting deficiencies, NRC first becomes cognizant of the extent of the contamination as part of the review of the decommissioning plan, which includes a description of site conditions, including the extent of contamination. Finally, there are several existing regulations that provide NRC with the capability to become aware of subsurface contamination. These regulations, however, do not specifically address this issue, and need interpretation from the current focus on acute exposure to apply to long-term environmental conditions.

To address the operating risk of chronic releases, the staff recommended requiring existing operating facilities to minimize contamination, as is currently required for future licensees. To address reporting deficiencies, staff recommended taking a risk-informed approach to identify sites with a high risk of subsurface contamination and require increased licensee monitoring and reporting programs for these sites and high-risk activities at sites. Similarly, the same risk-informed approach would be used to focus NRC inspections.

The Commission approved the staff's recommendation related to changes in licensee operations, but with the following comments. In addition to incorporating risk-informed approaches, the staff should ensure that they are performance-based. The staff will have to be very careful when crafting the guidance documents so that it is clear to the licensees and to the staff how much characterization information is enough. The staff should only ask for limited information.

NRC's future actions are:

1. During FY 2005-2006 develop a proposed rule and supporting draft guidance on changes to prevent future legacy sites and publish these documents for public comment;
2. During FY 2007, complete the final rule and supporting final guidance.

e. Appropriateness of Allowing Intentional Mixing

Some uncontaminated soil material is inevitably mixed with contaminated soil on many occasions, during the course of cleanup. This mixing is taken into account in the scenarios for evaluating the dose from residual material left at facilities undergoing license termination. Although no specific regulation addresses mixing, staff generally has not permitted intentional mixing of contaminated soil with noncontaminated soil. However, there may be financial or exposure reduction advantages in allowing intentional mixing, under certain limited circumstances. As a result, in SECY-03-0069, the staff identified the issue of the appropriateness of allowing intentional mixing of contaminated soil for meeting release criteria under the LTR. The results of the staff's analysis of this issue are given in SECY-04-0035 and are summarized below.

The staff analyzed the possible ways that a licensee could intentionally mix soil to lower its concentration and identified which of these scenarios should be considered further in the analysis. Using these scenarios, the staff evaluated the different options for meeting some, or all of, the LTR release criteria, and recommended an option for allowing intentional mixing. The analysis considered a wide range of relevant information and experience from NRC programs and regulations, and from external sources such as : the ICRP; the International Atomic Energy Agency; EPA; DOE; the Army Corps of Engineers' Formerly Utilized Site Remedial Action Program; and other domestic sources. Lastly, the staff evaluated the different ways that the preferred option could be implemented under the current LTR, and recommended regulatory tools for implementing its recommendations.

The staff concluded that the use of intentional mixing of contaminated soil to meet the waste acceptance criteria (WAC) of off-site disposal facilities, to facilitate meeting the LTR release criteria on a case-by-case basis, is consistent with current Commission practice. Existing Commission policy and practices are also consistent with consideration of intentional mixing of contaminated soil, in limited circumstances, on a case-by-case basis, to meet the release criteria of the LTR.

Therefore, the staff recommended allowing intentional mixing of soil to meet LTR release criteria in limited circumstances, on a case-by-case basis, while continuing the current practice of allowing intentional mixing for meeting WAC at off-site disposal facilities and for limited waste disposals. At a minimum, the limited circumstances under which staff would consider allowing intentional mixing of contaminated soil to meet LTR criteria include: any proposed mixing should be part of an overall approach to the site cleanup, which includes application of the ALARA principle, and considers only cases where it can be demonstrated that removal of the soil would not be reasonably achievable. Also, conditions under which staff would approve a case-by-case use of intentional mixing include, as a minimum:

- 1) The resultant footprint of the area containing the contaminated soil after license termination should be equal to or smaller than the footprint of the zones of contamination before decommissioning work begins: and
- 2) Clean soil, from outside the footprint of the area containing the contaminated soil, should not be mixed with contaminated soil to lower concentrations. Staff will consider rare cases where the only viable alternative to achieving the dose levels of the LTR appears to be using clean soil from outside the footprint of the area containing contaminated soil.

The Commission approved the recommended options. NRC's future actions are to develop revised guidance during FY 2005-FY 2006, that will be included in future revisions to the NMSS Consolidated Decommissioning Guidance in NUREG-1757. During this process there will be a formal request for public comment on the draft guidance.

2. Overall Outcomes Expected from Future Actions

The outcomes of the approved actions affect both existing decommissioning sites and future decommissioning sites. Existing decommissioning sites can be either licensees currently in decommissioning or formerly terminated NRC licensed sites, where more cleanup is needed. Within this group are complex sites, including those with long-lived radionuclides (e.g.,

uranium and thorium), that have difficulty decommissioning, for a variety of financial, technical, or programmatic reasons. These sites can be thought of as NRC “legacy” sites—those sites where past operating or financial events have created the existing problems that must now be overcome, in some way, to conduct sufficient cleanup and ultimately complete decommissioning and license termination. The staff’s actions are also prospective and based on lessons learned from the existing licensees. These actions will affect both currently operating licensees, who will decommission in the future, and new future licensees.

For existing decommissioning sites, particularly the complex sites with long-lived radionuclides, many of the approved options should facilitate decommissioning by addressing key challenges these sites must address. Consistent use of more realistic exposure scenarios could result in more economical decommissioning, while continuing to maintain safety. Furthermore, this option could also result in fewer sites that might need to use the restricted release or alternate criteria. For those few sites, however, that might still need to use the restricted release or alternate criteria provisions of the LTR, viable options for restricting site use have been approved that might also allow productive reuse of some sites. A clarification also was approved for the risk-informed graded approach for selecting institutional controls and the flexibility this approach provides to licensees. This approach clarifies the use of more conventional institutional controls, such as deed restrictions, for lower-risk sites, and durable institutional controls to enhance the effectiveness of institutional controls for higher-risk sites.

For future decommissioning sites, specific measures are planned for financial assurance, licensee operations and reporting, and on-site disposal, that should reduce or mitigate the potential for future “legacy” sites. These measures should also reduce the need for using the restricted release or alternate criteria provisions of the LTR. Together, these outcomes contribute to the Commission’s preference for license termination, with unrestricted release, which results in the greatest opportunity to return the site to productive use.

Finally, many of the approved options simply clarify and address questions about the relationship between the LTR criteria and criteria in other NRC regulations, such as the unimportant quantities limit in 10 CFR 40.13(a); on-site disposals in 10 CFR 20.2002; and the current case-by-case limit used for controlling the disposition of solid materials.

Table 1. NRC'S Risk-Informed Graded Approach for Institutional Controls to Restrict Site Use

<p>Lower Risk</p> <p>Lower Hazard Level (0.25-1 mSv/yr [25-100 mrem/yr])</p> <p>Shorter Hazard Duration– Lower Likelihood of IC Failure Shorter Half-Life (less than 100 years)</p>	<p>Higher Risk</p> <p>Higher Hazard Level (1-5 mSv/yr [100-500 mrem/yr])</p> <p>Longer Hazard Duration– Higher Likelihood of IC Failure Longer Half-Life (greater than 100 years)¹</p>
<p><u>General Grade</u></p> <p>Legally enforceable institutional controls</p> <p><u>Specific Grade</u></p> <p>Tailor specific type of institutional controls and land use restrictions to site-specific circumstances using scenario analyses from dose assessments</p> <p><u>Examples</u></p> <p>Single conventional “deed restriction”, such as a restrictive covenant (less control)</p> <p>Layered/redundant controls such as restrictive covenant, deed notice, and State registry (more control)</p>	<p><u>General Grade</u></p> <p>Durable and legally enforceable institutional controls with 5-year review</p> <p><u>Specific Grade</u></p> <p>Tailor specific type of institutional controls and land use restrictions to site-specific circumstances using scenario analyses from dose assessments</p> <p><u>Examples</u></p> <p>Layered/redundant controls that includes a State government control (durable)</p> <p>Conventional institutional control with NRC monitoring and enforcement after license termination using legal agreement (durable)</p> <p>Conventional institutional control with NRC monitoring and enforcement after license termination using regulatory authority under 10 CFR 20. 1401(c) (more durable)</p> <p>State or federal government ownership and control (NWPA 151(b)) (most durable)</p> <p>NRC Long-Term Control license (most durable)</p>

¹ It may be appropriate to treat sites with longer half-live contamination, but doses close to 0.25 mSv/yr (25 mrem/yr) as “Lower Risk” sites.

LIST OF RECENTLY ISSUED
NRC REGULATORY ISSUE SUMMARIES

Regulatory Issue Summary No.	Subject	Date of Issuance	Issued to
2004-07	Release of Final Review Standard (RS)-002, "Processing Applications for Early Site Permits"	05/19/2004	All holders of operating licenses for nuclear power reactors, all applicants for early site permits (ESPs), and all prospective vendors of nuclear power plants in the United States.
2004-06	Independent Survey of Power Reactor Licensees	04/16/2004	All holders of operating licenses for nuclear power reactors except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.
2004-05	Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power	04/15/2004	All holders of operating licenses for nuclear power reactors except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.
2004-04	Use of Code Cases N-588, N-640, and N-641 in Developing Pressure-Temperature Operating Limits	04/05/2004	All holders of construction permits or operating licenses for nuclear power reactors except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

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