POLICY ISSUE
(Notation Vote)

May 2, 2003 SECY-03-0069

FOR: The Commissioners

FROM: William D. Travers
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SUBJECT: RESULTS OF THE LICENSE TERMINATION RULE ANALYSIS

PURPOSE:

To provide the Commission with the results of the staff's analysis of issues associated with implementing the U.S. Nuclear Regulatory Commission's (NRC's) License Termination Rule (LTR). These results include evaluations of relevant information, recommended options to resolve each issue, recommended regulatory actions, and a schedule and resource estimate for completing the actions.

SUMMARY:

This paper provides the results of the Commission-directed analysis of LTR issues, with particular emphasis on resolving the restricted release and alternate criteria issue. The staff also evaluated other issues dealing with the relationship of the LTR release limits to other release limits, realistic exposure scenarios, measures to prevent future legacy sites, and intentional mixing. The staff proposes a variety of actions to address these issues including: 1) a rulemaking for measures to prevent future legacy sites; 2) revised guidance to support the rulemaking and to clarify restricted release, on-site burials, and realistic exposure scenarios; 3) revised inspection procedures and enforcement policy to enhance monitoring, reporting, and remediation to prevent future legacy sites; and 4) a Regulatory Issue Summary (RIS) to inform a wide range of stakeholders about the LTR analysis of each issue, Commission direction, and

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actions planned to resolve each issue. Finally, during the staff's briefing to the Commission on March 3, 2003, the Commissioners expressed an interest in the reactor decommissioning process and lessons learned implementing this process. The staff will provide this information to the Commission in the annual status report on the decommissioning program.

BACKGROUND:

The staff experience with the LTR has revealed some important implementation issues impacting the decommissioning of sites. The Commission directed the staff, in a June 18, 2002, Staff Requirements Memorandum, SECY-01-0194, to conduct an analysis of LTR issues, with particular emphasis on resolving the restricted release and institutional control issues and thus making the LTR provisions for restricted release and alternate criteria 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).

DISCUSSION:

1. Evaluation Process

The staff conducted the planned evaluations for the eight issues identified in SECY-02-0177 and identified one new issue and associated plans for future evaluations. The issues evaluated in the nine attachments are:

- Restricted release/alternate criteria and institutional controls (Attachment 1)
- Relationship between LTR release limits and other release limits
  - Unimportant quantities under 10 CFR 40.13(a) (Attachment 2)
  - Appropriateness of developing a separate uranium/thorium unrestricted release standard (Attachment 3)
  - On-site disposal under 10 CFR 20.2002 (Attachment 4)
  - Controlling the disposition of solid materials (Attachment 5)
- Realistic exposure scenarios (Attachment 6)
- Measures to prevent future legacy sites
  - Changes to financial assurance (Attachment 7)
  - Changes to licensee operations (Attachment 8)
- Appropriateness of allowing intentional mixing (new issue) (Attachment 9)

The staff's evaluations considered a wide range of relevant information and experience from other 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, extensive coordination among NRC staff was conducted to gain further information and perspective, as well as to identify interrelationships among the individual issues.

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

2. Summary of Evaluation Results

Results for three of the nine issues are summarized below. These three issues are summarized in view of recent heightened Commission interest on these important topics. Detailed results for each of the nine issues are given in Attachments 1-9, and a combined set of recommendations for all the issues is provided in Attachment 10. The potential applicability of these recommendations to the existing and future decommissioning sites is shown in Attachment 11. Attachment 11 indicates that the recommendations for realistic scenarios, financial assurance, and to some extent restricted release, have the potential to provide significant benefit to the implementation of the LTR 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 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. Key insights from these evaluations include: 1) many organizations recognize the potential for eventual failure of institutional controls, particularly over the long term; 2) appropriately selecting, implementing, monitoring, and enforcing institutional controls will help minimize or mitigate the potential for failure of institutional controls; 3) in some cases, an ongoing Federal role is critical to assure long-term effectiveness of institutional controls; and 4) flexibility is needed to implement institutional controls that address site-specific characteristics.

The staff evaluated several options, including those directed by the Commission, and offer several recommendations. Recommendations are made to clarify the LTR's risk-informed and graded approach for institutional controls and clarify how existing options can be used more effectively over long time periods. In addition, new options are recommended to involve NRC in long-term oversight, either with a monitoring and, if necessary, an enforcing role after license

termination, or with a possession-only specific license for the time period restrictions are needed. However, it should be noted that at the time the LTR was promulgated, 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 at a terminated site. The staff believes the recommended options can be implemented by revising the existing guidance and informing licensees and stakeholders with a RIS.

These recommendations should result in the following outcomes: 1) in the near-term, make the restricted release provision more viable and available for licensee use by providing new options and clarifying the risk-informed and flexible graded approach to select options; 2) provide more effective restrictions that protect the public health and safety over the long-term; 3) become more consistent with EPA's approach and recommendations of the National Research Council and the ASTM Standard; 4) should increase public confidence and acceptance of restricted use under the LTR; and 5) allow productive reuse of some sites. All these outcomes will enhance the decommissioning of existing licensed sites. Although they could also pertain to future licensees, the potential for future licensees needing restricted release should be reduced by the recommendations for other LTR issues, including measures to prevent future legacy sites, on-site disposals, and more realistic exposure scenarios.

b. 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 approaches used by EPA. Two options were evaluated to achieve more realistic scenarios. One was to improve the implementation of the current approach and guidance by training and sharing with licensees more realistic case studies. The other option was to allow justification of scenarios based on reasonably foreseeable future land use, as opposed to defaulting to very conservative scenarios such as the resident farmer. The staff recommends the option of using reasonable foreseeable land use. This option 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. Therefore, the staff recommends implementing this option using revised guidance, staff training, sharing the approach with licensees, and a RIS. The outcome of this recommendation would be a clearer approach and guidance to implement dose assessment exposure scenarios that are more realistic and risk-informed. Application of this approach might also result in fewer restricted release sites and less costly cleanup to unrestricted release levels.

c. Financial Assurance Measures to Prevent Future Legacy Sites

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-learned that can be applied to improve the regulations and reduce the risks to decommissioning financial assurance. Based on this experience, the staff focused on specific risks that could cause shortfalls in decommissioning funding including: 1) restricted release assumption causes underestimation of decommissioning costs; 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 due to 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 obtain NRC approval of the decommissioning funding plan and prepare a cost estimate assuming unrestricted release, unless the licensee can 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 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. A new rulemaking and implementing new guidance are recommended actions. The outcome of these recommendations should be to effectively reduce funding risks that could cause shortfalls in decommissioning funding, thus minimizing the potential for future legacy sites.

3. Recommended Implementation Actions

The following four actions would implement the recommendations in Attachment 10.

1) Rulemaking: Conduct a new rulemaking to examine adding and revising requirements for: a) financial assurance and b) licensee monitoring, reporting, and remediation to reduce the potential for future legacy sites. This single rulemaking would consider the specific recommendations in both Attachments 7 and 8 if conducting a rulemaking is approved by the Commission.

2) Guidance: Develop new guidance to implement the above rulemaking and revise existing guidance to address options for restricted release, on site disposal, and selecting realistic land use scenarios. Guidance development would include an opportunity for public comment.

3) Inspection and enforcement guidance: Revise the existing inspection and enforcement guidance to enhance monitoring, reporting, and remediation to prevent future legacy sites.

4) RIS: Prepare a RIS to inform a wide range of stakeholders about the LTR analysis of each issue, Commission direction, and planned actions.

4. Overall Outcomes Expected from Recommendations

SECY-02-0177 identified desired outcomes, or objectives, for each LTR issue to help guide the evaluations. As a follow-up, each of NRC's Strategic Plan performance goals was considered in conducting evaluations and making recommendations. Detailed outcomes relative to NRC's four performance goals are given in Attachment 12.

In summary, the outcomes of the staff's recommendations 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 recommendations are also prospective and based on lessons learned from the existing licensees. These recommendations 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 recommendations 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 maintaining safety. Furthermore, this recommendation 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 are recommended. A clarification also is recommended to improve the understanding of 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 recommended 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 recommendations 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); onsite disposals in 10 CFR 20.2002; and the current case-by-case limit used for controlling the disposition of solids materials.

5. General Schedule for Recommended Implementing Actions

The general schedule for the recommended actions is given below and is based on the assumption, for planning purposes, that the Commission's decision and direction for LTR follow-up actions will be received by September 30, 2003.

Commission paper on mixing	9/30/03
New rulemaking to prevent future legacy sites	
Rulemaking Plan	9/30/04
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
RIS	3/30/04

RECOMMENDATIONS:

The staff recommends that the Commission approve the options and issue-specific implementation actions in Attachment 10.

RESOURCES:

The LTR analysis and recommended follow-up actions are currently unbudgeted, but resource estimates for the fiscal years (FY) 2004 to 2006 will be addressed using the Planning, Budgeting, and Performance Management process during the development of the FY 2005 budget.

Total resources estimates are given below in full-time equivalents (FTEs) and thousands of dollars ($K), and a resource breakdown given in Attachment 13.

FY 03:	1.0 FTE	$0K
FY 04:	1.0 FTE	$0K
FY 05:	3.0 FTE	$150K
FY 06:	2.0 FTE	$100K
FY 07:	1.0 FTE	$50K

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The staff plans on briefing the Advisory Committee on Nuclear Waste in May 2003.

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Attachments:
1. "Results of Evaluations for the Restricted Release and Institutional Control Issue"
2. "Results of Evaluations for the Relationship between LTR Release Limits and the Unimportant Quantities Limit Under 10 CFR 40.13(a)"
3. "Results of Evaluations for Appropriateness of Developing a Separate Unrestricted Release Standard for Uranium and Thorium"
4. "Results of Evaluations for the Relationship between the LTR and On-Site Disposal under 10 CFR 20.2002"
5. "Results of Evaluations of the Relationship between the License Termination Rule and the Current Case-by-Case Approach for Controlling the Disposition of Solid Materials"
6. "Results of Evaluations for Realistic Exposure Scenarios"
7. "Results of Evaluations for Measures to Prevent Future Legacy Sites by Changes in Financial Assurance"
8. "Results of Evaluations for Measures to Prevent Future Legacy Sites by Changes in Licensee Operations"
9. "Planned Evaluations for Appropriateness of Allowing Intentional Mixing of Contaminated Soil under the License Termination Rule"
10. "Combined Set of Recommended Options and Implementation Actions for All Individual License Termination Rule Issues"
11. "Potential Applicability of License Termination Rule Issues to Existing Decommissioning Sites (SDMP, Complex, and Formerly Terminated Licensed Sites) and Future Decommissioning Sites"
12. "Major Outcomes of License Termination Rule Recommendations with Respect to NRC's Four Performance Goals"
13. "Breakdown of Resource Estimates for Recommended License Termination Rule Analysis Implementation Actions"

RESULTS OF EVALUATIONS FOR
THE RESTRICTED RELEASE AND INSTITUTIONAL CONTROL ISSUE

1. BACKGROUND

The staff provided background and an initial analysis of the restricted release issue in SECY-02-0177. The issue was defined and planned evaluations were identified. This attachment provides the results of the staff's evaluations.

2. ISSUE DESCRIPTIONS AND DESIRED OUTCOMES

2.1 Issue: U. S. Nuclear Regulatory Commission (NRC) licensees have difficulties arranging the institutional controls required by the restricted release and alternate criteria provisions of the License Termination Rule (LTR) that ensure long-term effectiveness. Subissues include:

1) Government and Tribes are unwilling to accept transfer of ownership of private sites, because of long-term liability and funding concerns (e.g., potential future additional cleanup, potential failure of engineered barriers, and the ability to obtain funds given to the U. S. Treasury for future custodial activities).

2) Lack of identifying independent third parties to ensure long-term effectiveness of institutional controls and, if needed, to provide control and maintenance if the current owner/licensee abandons the site, goes bankrupt, or if a subsequent owner does not provide control and maintenance. Also, there is a concern over long-term continuity of an independent third party.

3) Difficulties establishing legally enforceable institutional controls involving various types of "deed restrictions" that ensure effectiveness over long periods of time and if property ownership changes.

4) Unclear and perceived limited flexibility of the existing LTR risk-informed, graded approach to institutional control requirements for providing degrees of effectiveness based on dose levels and radionuclide half-life. This includes the meaning of "enforceable" and the threshold for needing "durable" controls, as well as use of engineered barriers, role of independent third party, and degree of public involvement.

5) Selecting realistic exposure scenarios that appropriately consider institutional control effectiveness and radiological hazard. Note that this issue is addressed under the realistic exposure scenario issue in Attachment 6.

The above issues pertain to both the restricted release provisions in 10 CFR 20.1403 and the alternate criteria in 10 CFR 20. 1404. One of the required conditions under 10 CFR 20.1404, is that a licensee "Has employed to the extent practical restrictions on site use according to the provisions of 10 CFR 20.1403 in minimizing exposures at the site."

2.2 Desired outcome: Make the restricted release and alternate criteria provisions of the LTR more available for NRC licensee use by identifying institutional control options and removing existing regulatory impediments (such as the issues identified above) currently associated with the institutional control requirements of both the restricted release and alternate criterial provisions of the LTR. Graded institutional control options should be based on radiological risk and time-frame that the institutional control must remain effective.

3. EVALUATIONS OF RELEVANT INFORMATION AND EXPERIENCE

This section summarizes the results of the staff's evaluations and provides insights that will be useful in evaluating the options in section 4 to resolve the issue.

3.1 U.S. Environmental Protection Agency

The staff reviewed key U. S. Environmental Protection Agency (EPA) guidance and met with EPA to discuss institutional control experience under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and The Resource Conservation and Recovery Act (RCRA). Based on this information, insights relevant to the LTR restricted release issues are summarized below.

Both short-term and long-term effectiveness of institutional controls have become a high priority in Superfund and RCRA programs. Because of the importance of institutional controls in selecting the overall remedy for a site, EPA has many roles. First, EPA develops guidance. Guidance has already been developed and is available for identifying, evaluating, and selecting institutional controls. This guidance describes types of institutional controls, examples, and limitations. In addition, criteria for evaluating controls are given. Some highlights from this guidance provide insights for the LTR analysis.

1) EPA allows use of proprietary or governmental institutional controls, but recognizes the weaknesses of these types of institutional controls, and that failure is possible. Therefore, EPA encourages layering of institutional controls (e.g., multiple types) to make them more effective over the necessary time period.

2) EPA considers EPA orders or permits as one type of institutional control that can be used, but these would have to be reissued when ownership changes. EPA orders or permits can be considered similar to an NRC license.

3) EPA considers that institutional controls should supplement engineering controls, and generally should not be used as the sole remedy.

4) Flexibility is needed for selecting appropriate institutional controls tailored for specific site needs, legal jurisdictions, and time periods.

In addition to the existing guidance, EPA released for public comment on February 19, 2003, draft guidance on monitoring and enforcing institutional controls. The staff's initial review noted that this guidance addresses ways to deal with issues that crosscut EPA's multiple programs. Extensive information is provided for issues associated with planning, implementing, monitoring, and enforcing institutional controls. Although much of this guidance provides specific

approaches or procedures applicable to EPA's multiple programs, some of the principles also are relevant to NRC's restricted release provision. Examples include: early and full life-cycle planning and cost estimating; early involvement by State and local governments and communities; rigorous periodic monitoring (e.g., Five-Year Review under CERCLA and community reviews) to ensure long-term effectiveness of institutional controls; and variability of enforcement tools, depending on the type of institutional control and jurisdiction. The staff will continue its review of this guidance to identify insights that could enhance the implementation of the LTR's restricted release provision.

EPA involvement with institutional controls extends beyond developing and issuing guidance. EPA also has an approval role for CERCLA and RCRA decision documents involving reliance on institutional controls. Regarding implementation, however, EPA turns over responsibility for institutional control effectiveness to the States after 10 years. Therefore, States have a statutory role for maintaining effective institutional controls. Similarly, EPA guidance on use of institutional controls when Federal agencies, other than EPA, transfer property to non-Federal users states that even if implementation of institutional controls is diligent, the ultimate responsibility for monitoring, maintaining, and enforcing institutional controls remains with the lead Federal agency.

Finally, EPA has an independent oversight, evaluation, and enforcement role. EPA conducts Five-Year Reviews under CERCLA as an independent evaluation to assure long-term effectiveness of a site's remedy, including institutional controls. If needed, appropriate actions can be taken. The Five-Year Review also applies to certain Federal facilities, where the Federal agency conducts the review and EPA approves the review. Under RCRA, EPA is just beginning to consider what it will do with the Thirty-Year Review and beyond.

In summary, it appears to the NRC staff, that EPA's overall approach to short- and long-term effectiveness of institutional controls involves the following principal elements:

1) EPA provides policy and guidance for evaluating, selecting, monitoring, and enforcing institutional controls;

2) Institutional controls supplement engineering controls;

3) Institutional controls are tailored to specific-site needs, using layering of multiple controls or using them in series to achieve the desired level and duration of effectiveness;

4) EPA approves decision documents that involve institutional controls;

5) Federal (for Federal facilities) or State governments have responsibility for effective implementation; and

6) EPA maintains independent oversight, including periodic comprehensive reevaluations to ensure effective implementation for the time period needed (e.g., Five-Year Reviews under CERCLA).

Overall, because of its approach, EPA relies on institutional control effectiveness and, therefore, does not require an assessment of potential safety consequences or use of dose "caps", assuming failure of institutional controls, as NRC requires in 10 CFR20.1403(e). Although different, these two approaches have the same goal of achieving protection. However, NRC's approach seeks finality, while EPA's approach does not, because of its continued oversight through the Five-Year Review process.

3.2 U.S. Department of Energy

3.2.1 Insights from Key DOE Long-Term Stewardship Documents Relevant to the Restricted Release Issue

The staff reviewed selected key U. S. Department of Energy (DOE) documents describing DOE's long-term stewardship program, including the January 2001 "Report to Congress on Long-Term Stewardship" (DOE/EM-0563), the October 2001 "Long-Term Stewardship Study" (DOE/EM-0604); a draft of DOE's Long-Term Stewardship Strategic Plan; and the August 2002 draft of "Long-Term Stewardship Science and Technology Roadmap." Furthermore, the staff has been monitoring DOE's program through contacts with DOE staff and attendance at various meetings. Based on this information, key insights relevant to the LTR restricted release issues are summarized below.

1) DOE documents describe many challenging long-term stewardship issues and DOE's approaches to address them for its sites. DOE considers that many of these challenges are also relevant to other governmental and private entities engaged in cleanup and long-term stewardship.

2) The following issues identified by DOE are also important to implementing restricted release under the LTR.

a) Ensuring continued effectiveness for long periods of time and if property ownership changes;

b) Developing a process for meaningful stakeholder/public involvement;

c) Ensuring long-term public access to information and outreach efforts; and

d) Providing reliable and sufficient funding.

3) DOE documents describe the scope of DOE's extensive and diverse long-term stewardship responsibilities and supporting technical capabilities. These documents demonstrate DOE's existing and future capability to provide stewardship for as many as 200 sites contaminated with radioactivity. In addition to DOE mission related sites, DOE already takes stewardship responsibility for sites from other agencies such as uranium mill tailings sites from NRC licensees under Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA); Formerly Utilized Sites Remedial Action Program sites from the U.S. Army Corps of Engineers; and one NWPA 151(c) site from an NRC licensee. Currently, DOE conducts long-term stewardship activities at 34 sites.

4) DOE's long-term stewardship activities are impacted by multiple and sometimes overlapping regulatory authorities, including: CERCLA; RCRA; UMTRCA; and State environmental laws and regulations.

5) In addition to DOE's existing extensive programmatic and technical capabilities, DOE also is conducting studies to significantly enhance its future capabilities. The draft Long-Term Stewardship Science and Technology Roadmap is an ongoing effort being developed to aid DOE in identifying and implementing knowledge and tools that will enhance the performance and reduce the costs at DOE's long-term stewardship sites. The draft Roadmap was compiled by Idaho National Engineering and Environmental Laboratory using an interdisciplinary team from industry, academia, Federal and State regulators, stakeholder groups, DOE national laboratories, DOE site contractors, and other Federal agencies.

The draft Roadmap effort systematically identifies gaps in existing long-term stewardship capabilities and recommends research and development that can address these gaps. Long-term stewardship is described as a system with many interrelated and interacting components. Four functions are identified for the long-term stewardship system (contain, monitor, communicate, and manage) and capabilities are identified to fulfill each function. For each capability, enhancements and research are recommended to address deficiencies or make improvements in existing long-term stewardship capabilities. Examples of recommended areas of research include: site modeling tools; engineered systems for contaminant containment; sensor and sensor systems for site monitoring; preservation and communication of site information; site-community relations; and effective and survivable land use controls.

Of particular interest to the LTR restricted release issue are the following two recommendations made to DOE for enhancing effective and survivable land use controls. The first recommendation consists of identifying potential legal strategies; assessing established agreements, and developing draft alternative legal instruments. The second recommendation is to provide archive options for maintaining land use control information for future generations.

3.2.2 Status of Potential DOE Changes to Long-Term Stewardship Policy and Management

The staff summarized DOE's consideration of potential changes to its Long-Term Stewardship Program in both SECY-02-0008 and SECY-02-0177, including the transfer of its stewardship responsibilities to the U. S. Department of the Interior (DOI) or another Federal land management agency. However, subsequent to status reports, DOE recently proposed a separate new DOE office (not under the Office of Environmental Management) that would include long-term stewardship rather than continuing to seek a transfer of its stewardship responsibilities to another Federal agency. This new Office of Legacy Management was announced and included in the President's fiscal year 2004 budget submitted to Congress in February 2003.

Under this proposal, DOE would maintain its current long-term stewardship responsibilities within this new office and give it greater visibility and responsibility. If approved by Congress, DOE's unique Federal long-term stewardship and technical capability for sites with radioactive

waste, noted above in section 3.2.1, will likely increase in the future as the DOE sites are remediated and transferred into long-term stewardship.

3.3 ECOS Long-Term Stewardship Interagency Cooperative Efforts

In 2001 the Environmental Council of States (ECOS) established a Long-Term Stewardship Subcommittee, which is a cooperative effort to share information among Federal, State, and Tribal organizations with a responsibility or interest in long-term stewardship.

NRC was invited to become involved with the subcommittee and attended the August 2002 workshop. During this meeting, status reports were presented by Federal agencies (DOE, EPA, U. S. Department of Defense (DOD), DOI, U. S. Department of Agriculture, General Services Administration, and NRC) regarding their institutional control programs and issues. Workshop attendees also reviewed a draft Long-Term Stewardship Agreement on shared principles that will be eventually signed by EPA, DOE, DOI, DOD, and ECOS.

Insights relevant to the restricted release issue include the following.

1) A continued NRC monitoring and involvement, as appropriate, with the ECOS Long-Term Stewardship Subcommittee provides an efficient mechanism to maintain awareness and exchange current information about issues and evolving solutions among other Federal agencies and States.

2) A draft Agreement gives useful guidance on long-term stewardship principles such as sustainability of institutional controls, roles, funding, and stakeholder involvement.

3) The Guardian Trust Pilot, sponsored by EPA, DOD, and the Commonwealth of Pennsylvania, was briefed to ECOS Subcommittee as an example of potential solutions to common long-term stewardship issues. The Pilot could offer a range of long-term stewardship services such as site surveillance, maintenance, groundwater monitoring, fund management, information management, and public outreach. This pilot project appears to be the best example of a private form of an "independent third party" option. However, the pilot is far from being available for use and may not have funding to complete. Thus, completion for use in Pennsylvania is doubtful and wider application to other States or agencies is even more uncertain, at this time.

3.4 Agreement States

3.4.1 Agreement State Implementation of the LTR

Information about the implementation of the LTR by Agreement States has been obtained through the following three efforts. First, the Office of State and Tribal Programs requested information from Agreement States in December 2001 about the status of implementing the LTR. The status has been periodically updated. As of December 5, 2002, responses from Agreement States indicated that most Agreement States have adopted a compatible rule. Of the 32 Agreement State Programs, 25 have adopted an equivalent LTR; 3 have adopted a more restrictive LTR; and 4 have not adopted the LTR. One State (Ohio) uses a decommissioning possession-only license in lieu of the institutional control requirement in the LTR (see section

3.4.2). A second State (Wisconsin), which is in the process of becoming an Agreement State, has adopted the Ohio model for a possession-only license in its application to become an Agreement State.

Second, the staff obtained the results of an informal Internet inquiry of Agreement States conducted by the State of California in June 2002. California used RADRAP, the electronic bulletin board for Agreement States, to ask the Agreement States if a restricted release site has been approved and, if so, what restrictions were imposed and if deed restrictions were used. Only five states responded to California's request and none of the five States has approved a restricted release. One of these States also commented that once a license is terminated, there is no way of enforcing any restrictions.

Third, during the December 2002 monthly call with the Organization of Agreement States (OAS), the staff provided an overview of the LTR Analysis, including reference to the background on the issues in SECY-02-0177 and the staff's plans to provide a Commission paper in April 2003. The staff also asked if any Agreement States had experience with the restricted release provisions of the LTR or if any Agreement States were considering the possession-only license, like Ohio.

The initial responses in the monthly call did not identify any other Agreement States that were considering restricted release. In addition, the OAS summarized the LTR Analysis discussion in the formal notes of the monthly call, which were provided to all Agreement States. Agreement States with any restricted release or possession only license experience were asked to contract the NRC staff. To date, no Agreement States have contacted the staff.

3.4.2 State of Ohio

The staff reviewed the State of Ohio's decommissioning regulation, a Commission paper that evaluated Ohio's regulation and possession-only license, and the Commission's Staff Requirements Memorandum approving the staff's recommendations. The staff also discussed implementation of the decommissioning possession-only license regulation with the Chief of the Bureau of Radiation Protection of the Ohio Department of Health.

Insights relevant to the LTR restricted release issues are as follows.

1) Based on the staff's evaluation and recommendation in SECY-98-209, the Commission found Ohio's possession-only license approach compatible with the LTR. Ohio became an Agreement State in 1999.

2) Although Ohio implemented the possession-only license in its decommissioning regulations to be consistent with State law, Ohio also believes a license is more protective than deed restrictions, especially for sites with long-lived radionuclides.

3) Ohio also considers a license to be more efficient, because it knows how to use a license and is unfamiliar with establishing and enforcing institutional controls.

4) Ohio plans on implementing the possession-only license by first issuing a decommissioning possession-only license when it approves a licensees decommissioning plan. When decommissioning activities are completed, these

conditions are removed from the license, leaving only the conditions for the possession only part of the license, such as specific restrictions on site access and use.

5) Ohio currently plans on using the license for only the Shieldalloy Metallurgical Corporation (SMC) site in Cambridge, Ohio. SMC also has an NRC license for a decommissioning site in Newfield, New Jersey.

Based on the above efforts, the staff concludes that Ohio is the only Agreement State with a possession-only license provision at this time, and no other Agreement States have used restricted release. Finally, the staff understands that Wisconsin has included the possession-only license in its application to become an Agreement State.

3.5 NRC Decommissioning Program Sites Considering Restricted Release

The staff reviewed and updated the status of complex decommissioning sites currently considering restricted release and summarized the current status below. This information is significant to the LTR Analysis of the restricted release issue because it provides the current context of sites that might be affected by the staff's recommended options.

On October 1, 2002, the staff identified in SECY-02-0177, four licensed decommissioning sites considering restricted release: 1) SCA Services Inc. (SCA), Michigan; 2) SMC, New Jersey; 3) Jefferson Proving Ground (JPG), Indiana; and 4) Sequoyah Fuels, Oklahoma. In addition, the staff projected the potential for five future licensed sites that are currently operating that could consider restricted release, because of the high volume of long-lived radionuclides each possess.

Changes have occurred subsequent to SECY-02-0177. At this time, two licensed decommissioning sites, SCA and SMC, are continuing to evaluate the restricted release option. A third site, the formerly licensed AAR site in Michigan, is a new site that is considering restricted release. A fourth site, JPG is considering continuing its agreement with other Federal agencies for institutional controls as part of its plans for site security and radiological surveys, but may use an NRC possession-only license until technology is available to characterize the unexploded ordnance on the site. Sequoyah Fuels is no longer seeking restricted release under the LTR because it is now decommissioning under Part 40 Appendix A.

Other decommissioning sites that might consider restricted release in the future are West Valley in New York and Safety Light in Pennsylvania. Another potential future need for institutional controls could include monitoring and maintenance of concrete structures, should the power reactor entombment option be developed.

Residual contamination at the decommissioning sites considering restricted release, at this time, all contain long-lived radionuclides (uranium or thorium). Therefore, for these sites, permanent (1000 year) institutional controls are necessary. This is similar to what is required under UMTRCA for permanent DOE long-term stewardship for uranium mill tailings sites .

The following sections summarize the current status of institutional controls at the four sites currently considering institutional controls for restricting future site use.

3.5.1 AAR, Michigan

The Commission directed the staff, in SRM-SECY-01-0194, to consider creative options that would make restricted release more available to a site, using AAR, a formerly licensed site, as a pilot for consideration of alternative approaches. The staff met with AAR representatives in an October 29, 2002 public meeting to discuss decommissioning options for the site, including the possibility of a restricted release. During the meeting, AAR presented the results of its recent dose analyses, completed to support its proposal for unrestricted release of the eastern portion of the site and a restricted release of the western portion of the site. The staff gave an overview of restricted release LTR requirements and options. AAR discussed its current thinking to enter into a settlement agreement with the NRC on the restrictions and controls needed for restricted release. The agreement would include using a deed restriction that would outline the restrictions on the site, such as prohibiting farming and developing residential properties on the site; the deed restriction would transfer to each subsequent owner of the property through the deed. The agreement and restrictive covenant legally would allow NRC or local and State governments to monitor and enforce the restrictions. The staff is currently working with AAR to resolve issues with the dose analyses. After resolution of those issues, the staff will continue to discuss with AAR the possibility of establishing a settlement agreement (including restrictive covenant) between AAR and NRC. Once AAR submits its plans, the staff would complete its review and inform the Commission of its results and any policy issues that result from AAR's proposal.

The approach being considered is significant to the LTR analysis because it tests one of the staff's options evaluated in section 4.2.1.2 for NRC to monitor and enforce after license termination using a legal agreement for sites with a low-dose hazard (i.e., less than 100 mrem/yr dose assuming failure of institutional controls) but long-duration hazard from thorium contamination. Interacting with AAR and evaluating potential approaches has been a useful pilot as the Commission directed in SRM-SECY-01-0194.

3.5.2 SCA Services, Michigan

The decommissioning plan for the SCA site is currently scheduled for submittal in September 2003. The staff has previously met with SCA to discuss preparation of the decommissioning plan and use of institutional controls appropriate for the thorium contamination in an existing capped land fill on the site. Most recently, SCA participated by teleconference in the October 2002 AAR public meeting, where NRC staff discussed the LTR restricted release requirements and options. Subsequently, the staff discussed with SCA the current status for selecting institutional controls. These interactions are part of the staff's current approach for pre-decommissioning plan consultations and the phased review for institutional controls.

SCA is currently evaluating both the unrestricted and restricted release options, based on dose assessment results and supporting data. Its evaluations of restricted release have included discussions with the State of Michigan regarding a State role in institutional controls because of the adjoining decommissioning site owned by the State (Michigan Department of Natural Resources) and the State Game Area and Federal Wildlife Refuge surrounding much of the SCA site. No commitment has been obtained from the State at this time. SCA will also need institutional controls for the hazardous chemicals also in the capped landfill on the site. Short term controls are being considered under the State's RCRA program.

This site is important to the LTR analysis because it is an example of seeking some form of a State role for long-term institutional controls to restrict future site use for long-lived radionuclide contamination (thorium) within an existing capped landfill that also contains hazardous chemicals under the State's RCRA program.

3.5.3 SMC, New Jersey

The decommissioning plan for the SMC site was submitted in August 2002. Shieldalloy representatives attended the October 2002 AAR meeting where NRC staff discussed the LTR restricted release requirements and options. The staff has completed an acceptance review of the decommissioning plan and has rejected the plan because of deficiencies with the proposed institutional controls, independent third party, financial assurance amount for control and maintenance of the engineered cell cap, and early documentation of advice received from affected parties.

One aspect of SMC's proposal was to transfer the site in the future, after operations had ended to a local or State government, for use as a park. However, the decommissioning plan did not provide any documentation that the government entities identified were considering or had committed to the transfer of the property or had indicated their willingness and capability to monitor and enforce the long-term control and conduct the necessary maintenance.

SMC also submitted a November 15, 2002, letter to NRC requesting deferral of NRC action on the decommissioning plan pending the staff's April 2003 Commission paper with the results of the LTR Analysis, so that SMC could consider the other options for restricting use that might be recommended by the staff to the Commission. SMC has informally expressed its interest in the option for a possession only license similar to its other site in Cambridge, Ohio.

The staff has rejected SMC's deferral request and plans on meeting with SMC to discuss the decommissioning plan deficiencies, and revising the decommissioning plan, using the staff's phased approach. For this site, the phased approach would consist of meetings to discuss and seek agreement on the licensee's approach to institutional controls and financial assurance before the licensee conducts the work needed to address the deficiencies identified by the staff and resubmit a revised decommissioning plan. During these meetings the staff plans on describing options for restricted release that the staff has recommended to the Commission, with the understanding that the Commission has not yet approved them. This approach allows SMC work to continue and not be delayed by the Commission's decision in response to the staff's April 2003 LTR Analysis Commission paper.

3.5.4 JPG, Indiana

The revised decommissioning plan for JPG was submitted in June 2002. The Department of the Army, which owns the site, proposed restricting site use with an Agreement with the U.S. Air Force and the U.S. Fish and Wildlife Service. The JPG approach to institutional controls appears acceptable. However, in a February 4, 2003, letter to NRC, the Department of the Army stated that the unexploded ordnance on-site that is co-mingled with the licensed material (depleted uranium) would prevent the collection of site-specific data that may be required by NRC to validate the off-site transport models. As a result, the Department of the Army requested an alternative schedule for submittal of a decommissioning plan and proposed that a

license amendment be negotiated with NRC that would create a 5-year renewable possession-only license for an indefinite time period. Under this proposal the institutional controls would be part of the site security and radiation control programs until the license is eventually terminated. The staff prepared a Commission paper (SECY-03-0031) that describes the licensee's proposal and the staff's agreement with the approach.

The JPG experience is useful to the LTR Analysis because it illustrates an acceptable way to establish institutional controls on Federally owned sites using documented agreements among Federal agencies. This successful example has limited value to NRC because there are no other Federally owned NRC licensed sites. It does, however, illustrate the potential use of a possession-only license for a complex decommissioning site, although the primary reason is to maintain land use controls until technology becomes available in the future to address the unexploded ordnance.

3.6 Other NRC Programs

3.6.1 Part 40, Appendix A, "Criteria Relating to the Operations of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentation of Source Material from Ores Processed Primarily for their Source Material Content"

Part 40, Appendix A, provides a regulatory framework for a robust and reliable long-term care system consisting of the following elements:

1) Federal government (DOE) ownership, monitoring, and maintenance, in perpetuity. (Note that under UMTRCA, the State where the site is located has the right of first refusal to become the long-term custodian, and DOE, or another agency designated by the President, must assume that role if the State defers);

2) DOE provides long-term custodial care under an NRC general license, with no license termination;

3) NRC oversight of the long-term custodian;

4) DOE's long-term custodial care supplements engineered barriers which are designed with the objective of lasting for up to 1000 years to the extent reasonably achievable, and in any case for at least 200 years without reliance on active maintenance. UMTRCA and Appendix A make clear that the reclamation design should be such that ongoing maintenance will not be required; and

5) Most sites are in isolated locations.

Other general insights from implementing the general license program for long-term care under Part 40, Appendix A, that are important to the LTR Analysis include:

1) UMTRCA required NRC to license the long-term custodial care of uranium mill tailings sites;

2) NRC implemented this statutory requirement by selecting a general license approach, which was implemented by a rulemaking. The Regulatory Analysis for this rulemaking concluded that either a general license applicable for all sites or a separate specific licenses for each site would have the same end result, but that the general license would be most efficient for this case because of the expectation that there would be one licensee (DOE) eventually, for all UMTRCA Title I and Title II sites;

3) DOE is required to prepare a long-term surveillance plan and submit it to NRC for approval, before license termination of the specific license. This plan provides the specific conditions that DOE would use to implement its long-term custodial duties at the site under the general license. Additional guidance for the LTR could be developed based on the NRC and DOE guidance and experience using these plans.

4) DOE is required to submit an annual report to NRC, that describes the status of each site under a general license. The annual report is the instrument NRC uses to efficiently monitor DOE activities and site conditions.

5) DOE and NRC have over 10 years of experience implementing the general license program, including developing and reviewing: cost estimates of long-term care; engineered controls; and site-specific long-term surveillance plans. NRC also conducts inspections or observes DOE inspections of the sites.

Recently, the staff made recommendations (SECY-02-0183) that the Commission approved (SRM-SECY-02-0183) with respect to using institutional controls on private property adjacent to the Western Nuclear Inc. site in Wyoming. The following insights from these decisions are important to the LTR restricted release issue.

1) Institutional controls can be used for off-site private properties as an alternative to DOE ownership required by Part 40, Appendix A, but only if properties cannot be purchased;

2) Institutional controls consisted of an easement that would be written to give DOE access to monitor and a restrictive covenant that would be written to give DOE authority to enforce restrictions;

3) These institutional controls are acceptable because the Federal government--DOE--has agreed to monitor, enforce, and provide the “durability”, because of DOE’s presence and statutory long-term care role at the adjacent site.

4) This approach for the Western Nuclear Inc. site, approved by the Commission, is somewhat similar to the staff’s recommended option in section 4.2.1 for NRC monitoring and enforcement after license termination using a legal agreement. Under this LTR-recommended option, the institutional controls, such as a restrictive covenant, would be written to include NRC monitoring and enforcement, as could be done with DOE for the Western Nuclear Inc. site.

3.6.2 10 CFR Part 61, “Licensing Requirements for Land Disposal of Radioactive Waste”

Part 61 includes provisions that address institutional controls for low-level waste disposal sites. Major concepts of Part 61 that are important to the LTR Analysis are given below.

1) The inadvertent intruder in the future is protected from waste by institutional controls for up to 100 years for Classes A and B wastes that will decay in 100 years to acceptable hazard levels. The waste concentration provides protection after that time. For Class C waste, protection is provided by both institutional controls for up to 100 years and engineering measures, either by greater depth of disposal or engineered intruder barriers designed to remain effective for 500 years. Beyond 500 years, protection is provided by the waste concentration.

2) Part 61 requires that disposal only be on land owned by the Federal or State government. A licensee would operate the facility and eventually transfer the license after site closure, stabilization, and post-closure observation to the Government owner, who would then be responsible for institutional controls. Thus, the license continues through the institutional control phase for the Federal or State government owners and would be terminated at the end of the phase. There could be earlier license termination if a transfer were to DOE, because NRC lacks regulatory authority over DOE for this specific activity. Note that DOE is not obligated to take a Part 61 site from a State.

3) Part 61 describes institutional control activities as including: 1) environmental monitoring; 2) periodic surveillance; 3) minor custodial care; and 4) administration of funds.

4) The period of institutional controls is determined by the Commission, but institutional controls cannot be relied upon for more than 100 years after transfer of control to the Government owner.

5) The Commission would approve the funding arrangement between the licensee and Government owner. Sufficient funds will be available to cover the costs of monitoring and any required maintenance during the institutional control period.

6) Active maintenance is acceptable for only the 100-year institutional control period. Thus, engineered intruder barriers would need to be designed to last 500 years without active maintenance.

3.6.3 <u>10 CFR Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada"</u>

Part 63 includes provisions that address institutional controls and assessment of future human intrusion for a geologic repository at Yucca Mountain.

A major concept regarding institutional controls for a geologic repository is in the following statements from 10 CFR 63.102(k):

Active and passive institutional controls will be maintained over the Yucca Mountain site, and are expected to reduce significantly, but not eliminate, the potential for human activity that could inadvertently cause or accelerate the release of radioactive material.

> However, because it is not possible to make scientifically sound forecasts of the long-term reliability of institutional controls, it is not appropriate to include consideration of human intrusion into a fully risk-based performance assessment for purposes of evaluating the ability of the geologic repository to achieve the performance objective at 63.113(b). Hence, human intrusion is addressed in a stylized manner....

Another important concept of geologic repository institutional controls is that the Energy Policy Act gave DOE responsibility for long-term control of the Yucca Mountain site after termination of the NRC license, without a continuing NRC role. Accordingly, Part 63 provides a provision for license termination after permanent closure of the geologic repository, during which time DOE would be responsible for institutional controls. Another provision requires DOE to submit, for NRC approval, a plan for control of all its future activities, after license termination, that could impact safety and performance of the repository. Although, eventual license termination for a geologic repository is anticipated by the regulations, it should be clearly understood that this approach resulted from a statutory mandate and relies on permanent Federal control by DOE and prior approval of DOE's plans for active and passive controls by NRC before license termination.

3.6.4 West Valley Policy Statement

In February 2002 the Commission issued the final policy statement for decommissioning criteria for the West Valley Demonstration Project. This policy statement approved the LTR as the decommissioning criteria for West Valley. Some concepts in the policy statement and NRC's response to comments that are summarized below are related to the LTR Analysis of the restricted release issue.

> 1) The policy statement recognizes that a flexible approach to decommissioning is needed for West Valley. For example, the Commission would consider an exemption allowing higher limits for doses on a failure of institutional controls if it can be rigorously demonstrated that the protection for future generations can be reasonably assured through more robust engineered barriers and/or increased long-term monitoring and maintenance.
>
> 2) If the NRC license cannot be terminated in a manner that provides reasonable assurance of adequate protection, then the appropriate action may be to require a long-term or even a perpetual license for a portion of the site until, if, and when possible, an acceptable alternative is developed to permit license termination. If a long-term or perpetual license is necessary, the Commission's intent is for that portion of the site to be decontaminated in the interim to the extent technically and/or economically feasible.

Some of the NRC responses to comments on the LTR guidance as it relates to West Valley are important to be aware of for the LTR Analysis and are summarized below.

> 1) The LTR and guidance are not prescriptive as to the criteria for acceptability of site-specific institutional controls or engineered barriers because of the wide range of residual radioactive contamination encountered at decommissioning sites licensed by NRC.

2) The Commission views engineered barriers referred to in the Statement of Considerations of the LTR as distinct and separate from institutional controls. The response clarifies NRC's view on the terms institutional controls, engineered barriers, and physical controls.

3.7 National Research Council Report on "Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites"

In 2000, the National Research Council's Board on Radioactive Waste Management published a report entitled "Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites."

The report describes a conceptual approach and specific measures and factors as they apply to the management of DOE waste sites and the challenges DOE faces in post-remediation site management.

In the staff's view, many of the issues discussed in this report are shared by other remediation programs that implement restrictions on future land use, including NRC's LTR analysis of the restricted release issue.

Therefore, the staff has summarized the following key points, from this extensive report, that might provide insights to help understand and resolve NRC's restricted release issues.

1) The Board's report concludes that there is no convincing evidence that institutional controls and other stewardship measures are reliable--the likelihood of their failure is relatively high. The report also refers to its earlier report, in 1995, entitled "Technical Bases for Yucca Mountain Standards," by noting one of the conclusions, namely that although institutional controls cannot be relied on to protect a repository against intrusion, they should be used as an added measure of protection.

2) To address the challenge of fallibility, the Board's report provides a broad range of advice. The report first establishes a general conceptual approach, to planning and decision-making, that would address the potential for failure and uncertainty. This approach is a framework to be applied on a site-specific level.

3) More specific advice is also provided by identifying criteria for designing an institutional management system including, for example: 1) layering of institutional controls to provide defense in depth; 2) redundancy that provides more than one organization to be responsible for controls; 3) stability through time; 4) periodic reevaluation of effectiveness; and 5) flexibility to tailor controls to site needs and correct and redirect.

4) Key activities of a comprehensive long-term stewardship program are also discussed: a) legal and physical restrictions on use; b) oversight and enforcement; c) information management; d) dissemination of information over time; e) periodic comprehensive reevaluations (e.g., EPA's Five-Year Reviews under CERCLA); and f) monitoring new emerging technologies to identify opportunities for more effective remediation.

5) The report also notes that the extensiveness and intensity of controls, monitoring, and enforcement should directly correlate with the severity of the risk to potential users of the site.

6) The important role of stakeholders is also addressed, including the view that external groups and interested citizens should retain the right of oversight and influence over organizations responsible for the site.

7) Primary weaknesses of institutional controls are discussed that help identify the nature of the problem and suggest solutions. Many weaknesses of institutional controls concern the fallibility of memory and susceptibility of present-day intentions to future political and economic pressures. Furthermore, the Board's report indicates that the viability over time of restrictions is likely to be especially questionable in cases where contamination levels are not high enough to prohibit all public access but not low enough to permit unrestricted use.

8) Measures to overcome deficiencies are noted in the report, such as: a) periodic evaluations can reduce or even eliminate some of the negative impacts of technical and institutional limitations; b) stable funding for monitoring and maintenance; c) oversight by the public (e.g., including public use of the site, such as a park).

9) Finally, one of the Board's conclusions of particular interest to the LTR Analysis is that oversight and enforcement if carried out with continuous vigilance, should help compensate for deficiencies in institutional controls.

3.8 ASTM Standard Guide for Use of Activity and Use Limitations

In July 2000, the American Society for Testing Materials (ASTM) published "Standard Guide for Use of Activity and Use Limitations, Including Institutional and Engineering Controls." Guidance is provided for selecting and implementing activity and use limitations (i.e., physical controls and institutional controls) for Federal, State, Tribal, and local remediation programs using a risk-based approach. The risk-based approach means using results of site-specific risk assessments. The general view is given that the greater the risk of exposure over a long period of time, the greater the need to use institutional controls that will be effective over the time period needed.

A selection process and criteria are described to evaluate appropriate types of institutional controls, which are similar to those in EPA guidance. Types of institutional controls and related advantages and disadvantages are described.

Some key insights important to NRC's restricted release issues are given below.

1) Activity and use limitations should be considered early and as an integral part of remedial action selection.

2) The potential for institutional control failure is recognized and, therefore, use of multiple institutional controls (i.e., layering) is encouraged to increase effectiveness.

3) Differences in State real estate laws result in differing degrees of effectiveness and long-term reliability of institutional controls. Certain legal doctrines may limit long-term enforceability. Therefore, there is a need for flexibility in tailoring institutional controls to the site and jurisdictional characteristics.

4) Institutional controls often supplement engineering controls, but engineering controls need monitoring and enforcement, through institutional controls, to remain effective.

5) The issue of enforceability is discussed, including the wide range of enforceability associated with the different types of institutional controls. The importance of considering both specific State property law and limitations on long-term enforceability is discussed. The need for an enforcer to monitor compliance and take legal action if necessary is discussed. This is critical because legal instruments do not enforce themselves. Thus, identifying a willing and able entity to monitor and enforce is critical to long-term reliability of institutional controls.

3.9 ISCORS Statement of Policy on Use of Institutional Controls

The ISCORS subcommittee on risk harmonization recently agreed to develop a set of institutional control principles. The draft is being prepared and will be eventually adopted by ISCORS.

4. EVALUATION OF OPTIONS

The staff identified and evaluated the following options to resolve the institutional control issues necessary for the viability of the restricted release and alternate criteria provisions of the LTR. These options are applicable to both existing and future licensees. However, the need for using the restricted release and alternate criteria provisions could be reduced for future licensees if the recommendations are implemented for other LTR issues for measures to prevent future legacy sites and more realistic exposure scenarios.

4.1 LTR Clarification Options

4.1.1 Clarify the LTR Risk-Informed, Graded Approach for Restricting Use.

The existing restricted release requirements of the LTR in 10 CFR 20.1403, discussions in the LTR "Statement of Considerations", and the decommissioning guidance (NUREG-1757, September 2002) provide a basis for a risk-informed graded approach for using institutional controls to restrict site use. However, this approach can be clarified and more completely explained in revised guidance to improve both understanding and use by licensees and the staff. This clarification applies to the restrictions that would be used for license termination with restricted release under 10 CFR 20.1403 or for license termination with the alternate criteria in 10 CFR 20.1404.

The clarification would address the following two parts of the risk-informed graded approach: 1) general risk framework and grades of institutional controls; and 2) specific grades of institutional controls determined by site-specific factors that could affect overall risk to public health and

safety. Each of these two parts of the graded approach is summarized below, and revised guidance could provide further details and examples.

1) General risk framework and grades of institutional controls.

The general risk framework can be defined by the hazard level and likelihood of hazard occurrence. This framework is summarized in Table 1 and discussed below.

The hazard level is established in the LTR (10 CFR 20.1403 (e)(ii)) as the dose level of 100 mrem/yr., calculated without institutional controls restricting site use. This dose level is the public dose limit. The LTR also defines the general grades of controls: sites below the 100 mrem/yr dose level require legally enforceable institutional controls and sites above the 100 mrem/yr dose level require both legally enforceable and durable institutional controls. Thus, the LTR requires that institutional controls provide more reliable or sustainable protection over the time period needed (i.e., durable) for sites that could exceed the public dose limit, assuming no restrictions. As noted below the "Statement of Considerations" also provides for durable controls for long-lived radionuclides regardless of the dose limit.

The likelihood of hazard occurrence can be simply defined by the hazard duration based on the half-life of the radionuclide contamination. Longer durations associated with longer half-lives, increase the likelihood of institutional control failure and hazard occurrence. The 100- year time period can be used as a simple way to define the likelihood of hazard occurrence. This approach is derived from discussions in section B.3.3 of the LTR "Statement of Considerations" about the durability of institutional controls and the 100-year time period. This section notes that short-lived nuclides, such as Cobalt-60 or Cesium-137 (half-lives 5.3 and 30 years respectively), would decay to unrestricted use levels in about 10 to 60 years, and, therefore, fall below the 100-year period. Discussions in section B.3.3 also note that "In a limited number of cases, in particular those involving large quantities of uranium and thorium contamination, the presence of long-lived nuclides at decommissioning sites will continue the potential for radiation exposure beyond the 100-year period. More stringent institutional controls will be required in these situations...." Thus, in the staff's view, the longer the duration of the hazard, the greater the likelihood of institutional controls failing and, therefore, the need for using controls that are more reliable and sustainable for the duration of the hazard (i.e. durable). The 100-year time limit is reinforced by the low-level waste disposal regulations, in 10 CFR 61.7, that require institutional controls for up to 100 years, which is described as a time period that would allow Class A and Class B low-level waste to decay to a level that will present an acceptable hazard to an intruder. For the above reasons, the staff could consider using 100 years to generally separate lower likelihood from higher likelihood of hazard occurrence.

Grades of institutional controls are not discussed in the LTR and the LTR does not define the term "durable" institutional controls as used in10 CFR 20.1403 (e)(ii). However, section 3.3 of the LTR "Statement of Considerations" gives some insight by discussing the durability of institutional controls and noting that more stringent controls will be required for exposures beyond the 100-year period, "such as legally enforceable deed restrictions and/or control backed up by State or local government control or ownership,

engineered barriers, and Federal ownership, as appropriate." Consistent with the LTR and "Statement of Considerations", NUREG-1757 indicates that institutional controls should be durable for sites exceeding the 100 mrem per year calculated dose, but less than the 500 mrem per year dose and for sites with long-lived radionuclides. The controls should be expected to last as long as they are needed. Thus, the staff believes that durable institutional controls would be needed for sites with a hazard level above the 100 mrem/yr value, or sites with a higher likelihood of hazard occurrence (i.e., hazard duration of greater than 100 years).

Based on these discussions, the staff could define two general grades of institutional controls: a) legally enforceable and b) durable and legally enforceable. The first grade of legally enforceable could use conventional institutional controls that are enforceable, such as a restrictive covenant. Examples of durable and legally enforceable institutional controls might include: a) layering of legally enforceable institutional controls that includes a government control (e.g., deed restrictions giving authority to Federal or State governments for monitoring and corrective action); b) State or Federal ownership and control; c) legally enforceable institutional controls monitored and enforced by NRC (new recommended option); and d) NRC possession-only specific license (new recommended option). Table 1 summarizes the grades and gives examples. It should be noted that for long-lived isotopes with doses closer to 25 mrem/yr, special consideration may be warranted, such as relying only on deed restrictions backed up by zoning, based on the language of the "Statement of Considerations."

2) Specific grades of institutional controls.

Specific grading of controls can be selected within the two general grades defined above. This approach recognizes that the site-specific factors affecting risk are highly variable from site to site. As a result specific grading recognizes the need for flexibility to tailor institutional controls to achieve the desired effectiveness. Specific grading involves evaluating and balancing numerous site-specific factors such as: a) physical characteristics of the site that limit future land use; b) land uses that could be adverse and therefore should be prohibited; c) land uses that are acceptable and could result in productive reuse of the site; d) dose assessment results (including low probability, alternate land use scenarios); e) engineered barriers and related maintenance; f) cost of monitoring controls and maintenance used as the basis for financial assurance; g) jurisdictional limitations on enforceability and long-term effectiveness of institutional controls; and h) advice from affected parties, such as local governments and the public. Particular attention might be needed to evaluate and tailor the durable institutional controls for specific sites that are well below the 100 mrem/yr value (lower hazard) but have long-lived radionuclides.

It is important to note that the few decommissioning sites considering restricted release at this time have either uranium or thorium contamination or both, and thus, may need some form of durable institutional controls, based on the duration of hazard.

Finally, the risk-informed graded approach can be implemented by the staff in its existing phased review of restricted release decommissioning plans and interactions with licensees. The phased review focuses on resolving institutional control and financial

assurance approaches first, so that the restricted release option is feasible before extensive staff effort is expended on detailed technical reviews of the decommissioning plan or development of and environmental impact statement.

Pros:

Provides clearer guidance to licensees and staff regarding the options and flexibility available under the existing risk-informed graded approach of the LTR.

Resolves the perception that Federal ownership is the only acceptable option to the staff.

Flexibility and tailoring institutional controls for site-specific factors is consistent with EPA guidance that defines criteria to use in evaluating and selecting appropriate institutional controls. It is also consistent with recommendations in the ASTM Standard and the National Research Council report on long-term institutional management, both summarized in sections 3.7 and 3.8.

Cons:

Additional, unbudgeted resources are needed to revise guidance.

4.1.2 Emphasize the Availability of the Option for Restricting Use after License Termination with Layered and Redundant Institutional Controls Together with an Independent Third Party that is also Responsible for One of the Institutional Controls.

Use layered (i.e., multiple) institutional controls to provide redundancy or backup if one of the controls fails (e.g., a restrictive covenant backed by local government land use zoning).

In addition to the institutional controls, implement the LTR requirement for an independent third party by clarifying that an independent third party needs to be independent from the owner, but may be an entity responsible for the institutional control. This option clarifies that a local or State government responsible for a zoning control could also agree to be responsible for monitoring the controls and assuming control of the site and maintenance in the event the owner cannot. In agreeing to the third party role, governments would need to agree that the financial assurance provided for future maintenance and repair of the site and engineered controls are sufficient. This agreement on sufficiency of funding is important to resolve concerns regarding future financial liability. This option, while efficient, could be viewed as less effective than an a third party that is fully independent from parties responsible for the institutional controls because a government entity would be monitoring itself.

This option is a variation on option 2(a) in Attachment 1 of SECY-02-0177, where the staff planned on evaluating redundant institutional controls without the independent third-party oversight. The staff's evaluation resulted in concluding that some type of third-party oversight of institutional controls is necessary to have assurance of continued effectiveness. This is needed even in the short-term because of the likelihood of ownership changes over the next few decades. Option 2(a) would require a rule change, which the staff does not consider warranted.

This option could be used for lower hazard level (less than 100 mrem/yr cap) or shorter-duration sites.

Pros:

Redundancy of controls accounts for potential failure and compensates for a less than fully independent third party. The remaining uncertainty may be acceptable for low-hazard and short-duration sites.

Simplest and most efficient to use and could be easier to identify an independent third party who already has a responsibility for an institutional control.

Could be enforced by courts and local government

Could be a viable way to address the independent third party for some cases and resolve the issue of institutional controls remaining effective over time and as ownership changes.

Cons:

Reduced independence of the third party could result in a conflict of interest when the third party is both responsible for the institutional control and the oversight of the institutional control. For example, if a local government with zoning responsibility over a site were pressured politically or by business interests to change zoning, there would not be another party independent from the local government to question the change and raise safety concerns.

Could reduce public confidence by giving the appearance of being less protective and not maintaining safety.

4.2 New Options to Restrict Site Use

4.2.1 Add a New Option for Restricting Use by NRC Monitoring and Enforcing Institutional Controls after License Termination.

NRC could monitor and enforce institutional controls after license termination by using either authority under 10 CFR 20.1401(c) or legal agreement. These two approaches are described below. Under this option NRC would make the institutional control "durable" by providing Federal Government independent oversight, including five-year rechecks, if needed. This is one of the new options that the Commission directed the staff to consider in SRM-SECY-01-0194. NRC oversight could be "graded" and could vary from simple review of owner certification letters to periodic site inspections of land use and institutional controls.

Institutional controls implemented by the licensee would need to specifically authorize NRC access to the site to periodically inspect and conduct five-year rechecks, if needed. A standby trust could be established before license termination for the purpose of providing maintenance through a trustee if the owner cannot and because NRC, as a regulator, cannot conduct maintenance activities. Such a standby trust would be similar to what has been done for some

uranium mill tailings sites under 10 CFR Part 40, Appendix A, to use if the licensee goes bankrupt. If this occurs, NRC would activate the standby trust and select a trustee to continue the site monitoring and maintenance that had been done by the owner/licensee using funds from the financial assurance instrument, which would be separate from the standby trust.

The financial assurance required by 10 CFR 20. 1403 would need to be established and the owner (previous licensee) and its successor owners through a deed restriction, would need to agree to pay NRC annually for the activities NRC conducts. Another alternative would be to provide a single payment at the time of license termination, like UMTRCA sites, which NRC would need to recover through its appropriation request.

4.2.1.1 NRC Monitoring and Enforcement Under the Regulations (10 CFR 20.1401(c)) if there is a Significant Threat

Licensees would select and implement enforceable institutional controls consistent with existing NRC guidance, but NRC would act as the independent third party to monitor and enforce the controls under existing LTR provision 10 CFR 20.1401(c).

The LTR general provision under 10 CFR 20.1401(c) provides for the following potential future NRC action after license termination: "... the Commission will require additional cleanup only if based on new information, it determines that the criteria of this subpart were not met and residual activity remaining at the site could result in significant threat to public health and safety." This provision could include NRC monitoring to identify new information such as failure of institutional controls or adverse changes in land use. Monitoring could include the owner agreeing, as a condition to license termination and included in a deed restriction, to provide in response to an NRC request, a letter certifying effectiveness of controls as a simple way to notify NRC and local governments. By including the obligation to respond to NRC periodic requests in the deed restriction, future owners would be required to provide NRC information about the site. In addition, NRC could seek to have the local government agree to provide an annual letter reporting on effectiveness of controls.

Such new information could then be evaluated to determine if the changes could result in the LTR criteria no longer being met and, if not met, could result in a significant threat to public health and safety. The term "significant threat" is not defined in the LTR. In fact, the Commission in the "Statement of Considerations" for the LTR specifically declined to define the term. One could argue that a "significant threat" might be as high as 500 mrem/yr since the LTR allows restrictions to fail at that level under 10 CFR 20.1403(e)(2). The staff could use a dose estimate above the public dose limit of 100 mrem/year as a "trigger" level to further evaluate the specific circumstances to determine if there is a significant threat and what corrective actions might be needed.

NRC could enforce the continued effectiveness of the restrictions by taking the following approach. If NRC were to determine that the new information could result in a significant safety threat, NRC could require additional cleanup, as stated in 10 CFR 20.1401(c), if the adverse land use were not changed and if effective institutional controls were not reimplemented.

The licensee would need to establish sufficient financial assurance that includes the long-term cost of NRC (acting as an independent third party) monitoring and other actions, as required

under the LTR [10 CFR 20.1403(c)]. The licensee, as part of license termination, and its successors through a deed restriction, would need to agree to pay NRC annually for the activities NRC conducted, or provide a single payment at the time of license termination, like UMTRCA sites, which NRC would need to recover through its appropriation request.

This option would be considered one type of a durable institutional control.

Pros:

Allows license termination and finality as envisioned under the LTR, but NRC remains involved to some degree.

Removes the NRC license "stigma" from the site, which could be important for future property value and sale. However, the restrictions and NRC monitoring may discourage future purchasers.

Some licensees may prefer license termination.

Allows NRC monitoring to identify new information, but only enforce if there is a significant safety threat.

Resolves the independent third party issue.

Resolves the institutional control long-term reliability issues by NRC monitoring and taking action to reimplement institutional controls if necessary, over time.

More consistent with EPA's approach for five-year reviews, including evaluating the effectiveness of institutional controls.

Cons:

The "Statement of Considerations" did not envision a periodic monitoring role for the NRC after license termination. However, there is nothing in the LTR that precludes it, provided that licensable material remains at the site.

Annual reporting and fees may be difficult to secure from future owners.

If a system is needed to monitor terminated sites because of the potential impact on public health and safety, one could argue that the site is not appropriate for license termination. Rather, a possession-only license may be more appropriate.

The option has not been implemented before by NRC or legally tested.

The deed restriction is dependent on the law of the site's jurisdiction and may not be viable in all states.

Could not be used for the lower hazard (e.g., less than 100 mrem/yr dose cap sites) because they would not present a significant safety threat under 10 CFR 20.1401(c).

No definition of significant threat to safety; guidance may need to be developed

Although NRC costs could be minimal for monitoring simple sites with institutional controls; increased costs could be needed if NRC had to take some action or if the owner reporting fails.

If the owner and future owners do not provide information to the NRC, NRC may need to enforce the restrictions and may need to conduct periodic inspections instead.

Funds received annually from the owner for NRC activities or a single payment would go to the U.S. Treasury, and NRC would need to recover these funds through the appropriation process (similar to what DOE currently does for UMTRCA sites making a payment to the U.S. Treasury).

4.2.1.2. NRC monitoring and enforcement under a legal agreement

NRC would monitor and enforce under legal agreements or authority written into institutional controls, similar to the approach under consideration for use with AAR, summarized in section 3.5.1. This option is essentially the same as the option under 4.2.1.1, but based on a legal agreement and deed restriction rather than the regulation (10 CFR 20. 1401(c)).

Monitoring could include the owner agreeing, as a condition to license termination and included in a deed restriction, to provide a response annually or at other frequency to an NRC request for certifying effectiveness of controls as a simple way to notify NRC and local governments. By including this obligation in the deed restriction, future owners would be required to also provide a response.

The licensee would need to establish sufficient financial assurance for the long-term cost of NRC (acting as an independent third party) monitoring and other actions, as required under the LTR (10 CFR 20.1403(c). The licensee, as part of license termination, would need to agree to pay NRC annually for the activities NRC conducted, or provide a single payment at the time of license termination, like UMTRCA sites, which NRC would need to recover through its appropriation request.

This option could be used for any site.

Pros:

Allows license termination and finality as envisioned under the LTR, but NRC remains to a limited degree.

Some licensees may prefer license termination.

Removes the NRC license “stigma” from the site, which could be important for future property value and sale. However, the restrictions and NRC monitoring may discourage future purchasers.

Resolves the independent third party issue by NRC becoming the third party.

Resolves the institutional control long-term reliability issues by NRC monitoring and taking action to reimplement institutional controls if necessary over time.

A somewhat similar approach was approved by the Commission for the Western Nuclear Inc. site, where authority could be written into institutional controls for DOE to monitor and enforce controls on the private property adjacent to the site.

Cons:

The "Statement of Considerations" did not envision a periodic monitoring role for the NRC after license termination. However, there is nothing in the LTR that precludes it, provided that licenseable material remains at the site.

This has never been implemented by NRC or legally tested.

Annual reporting and fees may be difficult to secure from future owners.

If a system is needed to monitor terminated sites because of the potential impact on public health and safety, one could argue that the site is not appropriate for license termination. Rather, a possession-only license may be more appropriate.

The deed restriction is dependent on the law of the site's jurisdiction and may not be viable in all states.

Although NRC costs could be minimal for monitoring simple sites with institutional controls, increased costs could be needed if NRC must take some corrective action.

Funds received annually from the owner for NRC activities, or received as a single payment, would go to the U.S. Treasury, and NRC would need to recover these funds through the appropriation process (similar to UMTRCA sites making a payment to the U.S. Treasury)

4.2.2 Add a new option for restricting use by an NRC possession-only specific license after completion of remediation.

This option would involve amending the existing specific license for decommissioning to a possession-only specific license, after completing remediation and after LTR dose criteria are met. For such sites, the possession-only license acts as an institutional control to maintain the restrictions necessary to meet the LTR criteria.

For this option, all the requirements of 10 CFR 20.1403, other than institutional controls, would be required, including the public participation provisions and financial assurance. Financial assurance would, for this case, be based on a cost estimate for NRC monitoring and inspection fees, and any maintenance costs.

New license conditions for land use restrictions, monitoring, maintenance, reporting, and financial assurance would be specified in the possession-only license. A Long-Term Care Plan implemented under the possession-only license could provide the detailed plans for restrictions,

monitoring, reporting, and maintenance similar to the Long-Term Surveillance Plans under 10 CFR Part 40, Appendix A. The possession-only license is the type of institutional control, similar to EPA's orders or permits, that provide the necessary restrictions on access or future land use. NRC would monitor, inspect, and enforce under the license authority.

If site ownership changes in the future, the possession-only license would need to be transferred before ownership passes. Therefore, an independent third party is not needed. However, a standby trust would need to be established, similar to what has been done for some uranium mill tailings sites under Part 40, Appendix A, because of the potential for the licensee to go bankrupt or out of business. If this occurs, NRC would activate the standby trust and select a trustee to continue the site monitoring and maintenance that had been done by the owner/licensee, using funds from the financial assurance instrument.

At the end of the period of restricted site use, the possession-only license could be terminated; however, for long-lived radionuclides, the license would likely be permanent, but periodically renewable (e.g., every five years). The Timeliness Rule has been met with completion of remediation and compliance with the LTR dose criteria.

This option could be used for any restricted release site that is unable to establish acceptable institutional controls using other available options.

No rulemaking is needed to implement this option; it can be implemented with revisions to existing guidance for decommissioning and use of possession-only license. Environmental reviews, which may include an environmental impact statement, would need to be done for the license amendment establishing the possession-only license. An opportunity for a hearing would be provided as part of the amendment process.

Pros:

This option addresses the concern of some that the Federal government, which allowed a site to be contaminated through its license authorization and termination actions, should not leave long-term protection up to other parties.

Provides viable and immediately available option that could be selected by licensees currently preparing their decommissioning plans and thereby avoid potential delays.

Provides licensees with the ultimate solution to the LTR requirement for legally enforceable institutional controls or durable institutional controls if no other acceptable options are available. This option would resolve all restricted release issues.

This is the most effective monitoring and enforcement tool available to NRC for short- or long- term use that NRC knows how to use. Avoids the legal complexity and uncertainty of establishing enforceable institutional controls that will be effective over long-time periods.

Gives flexibility for other solutions for restricted use to evolve and possibly become available in the future, such as DOE ownership under NWPA 151(b) or the Guardian Trust Pilot for an independent third party.

No rulemaking needed to implement; can implement with revisions to existing guidance for decommissioning and use of possession-only license.

NRC's licensing oversight of the few complex decommissioning sites could be combined with the existing NRC oversight of over 20 uranium recovery sites required by UMTRCA. Thus, there is an existing statutory NRC mission and well-established program to provide regulatory oversight in perpetuity for as many as 40 sites that are very similar to the complex decommissioning sites and would require about the same type of monitoring.

Similar to EPA , State of Ohio, and NRC, under UMTRCA/Part 40 Appendix approaches, for a government entity to remain in an oversight role to ensure long-term effectiveness of institutional controls.

This approach should increase public confidence because this option would be more protective of future generations because of continuous Federal government involvement. This approach is also consistent with EPA's approach to continued oversight.

Staff and Commission reviewed and found the Ohio possession-only license approach more stringent than the LTR, but because this approach did not create a significant regulatory conflict, it was determined to be compatible with NRC's program.

Most cost effective option for a few sites.

Low-cost NRC monitoring that could use an annual letter of certification or registration.

NRC resources would be fee recoverable from the licensee.

Cons:

Concerns could be raised about lack of finality and departure from the LTR goal of license termination and no further NRC role. However, this approach may be only needed for rare cases to resolve existing decommissioning sites. Furthermore, it should not be a precedent for future sites because many of the staff's other recommendations in this paper will minimize future legacy sites that might need restricted release.

NRC licensing oversight for some sites could be permanent because the current sites considering restricted release are sites with uranium and thorium contamination. Although this NRC role was not envisioned under the LTR, it is similar to the existing statutory role under UMTRCA for permanent NRC oversight of DOE's long-term stewardship of Title I and II uranium recovery sites. Therefore, such a permanent oversight role for long-term stewardship is not a new role for NRC, as an agency.

A licensee could object to concept and fees over the long-term, including the license "stigma". On the other hand, this option would only be used if the licensee selected it because it was unable to arrange other institutional controls or third party oversight under the LTR.

4.2.3 Add a new option for restricting use by an NRC general license after completion of remediation.

This option would involve terminating the existing specific license after completing remediation and after LTR dose criteria are met and issuing a new general license for long-term care. The Commission directed the staff to evaluate a general license option. The general license would be a type of institutional control, similar to EPA's orders or permits, that provides the necessary restrictions on future use. Required environmental reviews, advice from affected parties, and financial assurance would continue.

This option could be used for sites with a higher hazard (above 100 mrem/yr dose cap), longer duration (e.g., long-lived radionuclides such as uranium or thorium sites), or if a site cannot establish other types of acceptable institutional controls.

A Long-Term Care Plan implemented under the general license could provide the site-specific conditions for restrictions, monitoring, and maintenance similar to the Long-Term Surveillance Plans under 10 CFR Part 40, Appendix A. Reporting requirements could also be included in the general license, such as a periodic registration process; an annual report similar to the current approach used under 10 CFR Part 40, Appendix A, for uranium recovery sites; or an annual letter certifying effectiveness of restrictions and results of monitoring and maintenance. However, unlike the 10 CFR Part 40, Appendix A approach, where the general licensee will only be the Federal government, the general licensee for this option will be private entities who might change over time and may not understand that they are a licensee.

A rulemaking would be needed to establish a new general license program and fee category.

Pros:

Except for the cost of rulemaking and the associated time to complete the rule, this option has the same pros as the possession-only specific license.

Cost of NRC monitoring would be fee-recoverable from the licensee thru a new fee category.

Cons:

No advantage over the possession-only license option.

Requires new rulemaking to establish the general license program and fee category.

The time need to complete a new rulemaking (2-3 years) would further delay the decommissioning schedules for some licensees that are currently preparing their decommissioning plans and seeking viable options for institutional controls.

Rulemaking would not be cost-effective for a few sites.

It is not clear that NRC could require prior approvals of a change in ownership under the general license.

4.2.4 Continue to monitor the DOE long-term stewardship program changes and reevaluate the potential for restricting use through future site transfers to DOE under NWPA 151(b).

Revised DOE policy and program changes have been recently settled by including the new Office of Legacy Management in the President's budget for Congressional approval. Therefore, continued NRC monitoring both at the staff and senior management level may be useful to determine if and when NRC might again discuss potential transfer of a few sites to DOE under NWPA Section 151(b). NRC could also be supportive of DOE's new office in communications with Congress.

Pros:

DOE has unique and extensive stewardship capability for as many as 200 future sites, that will require a mission and supporting infrastructure to last in perpetuity. Thus, DOE ownership continues to be a highly effective Federal solution that would resolve the institutional control and third party issues.

Transfer of privately owned sites to DOE is already authorized under NWPA Section 151(b) and could provide another viable option for durable institutional controls, if DOE agrees.

Under the expanded and enhanced long-term commitment to long-term stewardship by DOE's new Office of Legacy Management, there might be an opportunity to reconsider, at an appropriate time, transfer of NRC licensed sites to DOE.

Cons:

There is uncertainty in Congressional approval of DOE's new office.

There is continued uncertainty about DOE's willingness to accept NRC licensed sites.

4.2.3 Remove dose cap requirements for sites with Federal ownership or control.

For sites that could be Federally owned or under Federal control, including NRC licensing, do not assume failure of the Federal government, and therefore, the dose cap requirements of the LTR assuming failure of institutional controls would not apply.

Pros:

Could make restricted release more available for a site that could not meet the 500 mrem/yr dose cap.

Could result in less cleanup and lower cost to licensee.

Similar to EPA's approach, which does not assume failure of institutional controls, because of its overall approach to effectiveness, including EPA's ongoing role to conduct Five-Year Reviews (see section 3.1).

Cons:

Would require rulemaking to change, or an exemption.

Likely would reduce public confidence because of removing an existing LTR dose requirement and the appearance of becoming less protective of future generations.

Removes the dose cap, which is the tool currently used to implement the risk-informed and graded approach to institutional controls.

Reduces long-term protection of future generations by removing the dose caps , which limits the dose consequences should the Federal government controls fail.

5. RECOMMENDATIONS

The recommended options and recommended implementation actions to resolve this issue are provided below.

1.1 Clarify the existing risk-informed, graded approach for restricting use. Implement with revised guidance and a RIS.

1.2 Emphasize the availability of the option of restricting use with layered and redundant institutional controls together with an independent third party that is also responsible for one of the institutional controls. Implement with revised guidance and a RIS.

1.3 Add a new option for restricting use by NRC monitoring and enforcement of institutional controls after license termination using either the regulation or legal agreement. Implement with revised guidance (that includes a model restrictive covenant) and a RIS.

1.4 Add a new option for restricting use by an NRC possession-only specific license. Implement with revised guidance and a RIS.
Note that the staff plans on continuing to monitor DOE's Long Term Stewardship Program changes and reevaluate the potential for restricting use through future site transfers to DOE under NWPA 151(b).

Note that the staff plans on continuing to monitor and participate, where beneficial to the staff, with cooperative, interagency activities to share information and develop solution to long-term stewardship/institutional controls issues (e.g., ECOS Long-Term Stewardship Subcommittee, DOE Long-Term Stewardship Roadmap development).

Note that the staff will continue to explore with licensees the use of the recommended approaches for restricted release, pending the Commission's deliberations. The staff will inform the Commission if a licensee is willing to adopt any of these approaches. In addition, if the Commission approves one or more of the options, the staff will seek to implement the option(s) in advance of the RIS and guidance if it will further the decommissioning process.

TABLE 1. NRC'S RISK-INFORMED GRADED APPROACH FOR INSTITUTIONAL CONTROLS TO RESTRICT SITE USE

Lower Risk **Lower Hazard Level (25-100 mrem/year)** **Shorter Hazard Duration– Lower Likelihood** **Shorter Half-Life (less than 100 years)**	**Higher Risk** **Higher Hazard Level (100-500 mrem/year** **Longer Hazard Duration– Higher Likelihood** **Longer Half-Life (greater than 100 years)**[1]
General Grade Legally enforceable institutional controls Specific Grade Tailor specific type of institutional controls and land use restrictions to site-specific circumstances Examples Single conventional "deed restriction" such as a restrictive covenant (less control) Layered/redundant controls such as restrictive covenant, deed notice, and State registry (more control)	General Grade Durable and legally enforceable institutional controls Specific Grade Tailor specific type of institutional controls and land use restrictions to site-specific circumstances Examples Layered/redundant controls that includes a State government control (less durable) Conventional institutional control with NRC monitoring and enforcement after license termination using legal agreement (less durable) Conventional institutional control with NRC monitoring and enforcement after license termination using regulatory authority under 10 CFR 20. 1401(c) (more durable) State or Federal government ownership and control (NWPA 151(b)) (most durable)

[1] It may be appropriate to treat sites with longer half-live contamination but doses close to 25 mrem/yr as "Lower Risk" sites.

RESULTS OF EVALUATIONS FOR THE RELATIONSHIP BETWEEN LTR RELEASE LIMITS AND THE UNIMPORTANT QUANTITIES LIMIT UNDER 10 CFR 40.13(a)

1. BACKGROUND:

There is a potential inconsistency between the dose allowed for unrestricted release by the License Termination Rule (LTR) in 10 CFR 20.1402, and the resulting dose if 10 CFR 40.13(a) were used as a decommissioning criterion, and the appropriate relationship between the two regulations is not clear. The staff noted this potential inconsistency to the Commission in SECY-01-0194, "AAR Manufacturing Group, Inc., and Proposed Use of Unimportant Quantities of Source Material in 10 CFR 40.13(a) as Decommissioning Criteria." SECY-01-0194 described AAR Manufacturing Group, Inc.'s (AAR's) proposed use of unimportant quantities of source material, in 10 CFR 40.13(a), as a decommissioning criterion.

In a June 18, 2002, Staff Requirements Memorandum (SRM), the Commission approved the staff's proposal to deny AAR's request and require AAR to return to its approved remediation plan [consistent with the Site Decommissioning Management Plan (SDMP) Action Plan criteria], meet the terms of the LTR voluntarily, or be subject to license, under which the LTR would be applicable. The SRM also directed the staff to "... evaluate the appropriate relationship between 10 CFR 40.13(a) and [the LTR] with particular emphasis on identifying any potential inconsistencies." The staff has interpreted this direction in a broad sense and is evaluating this relationship as a generic issue for any licensee (as the staff's recommendation to deny AAR's proposal and the Commission's associated direction in SRM-SECY-01-0194 were specific to AAR, which is a formerly licensed site).

2. ISSUE DESCRIPTION AND DESIRED OUTCOME:

2.1 Issue: There is a potential inconsistency between the dose constraint of 0.25 milliSievert per year (mSv/yr) [25 millirem per year (mrem/yr)] for unrestricted release in the LTR and the resulting dose if 10 CFR 40.13(a) were used as a decommissioning criterion, and the appropriate relationship between the two regulations is not clear. The doses associated with matter containing less than 0.05 percent by weight (wt%) source material can exceed the public dose limit of 1 mSv/yr (100 mrem/yr), and thus exceed the 0.25 mSv/yr (25 mrem/yr) dose constraint for unrestricted release in the LTR.

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. The radiological criteria for unrestricted use in 10 CFR 20.1402 state that a site will be released for unrestricted use if the residual radioactivity results in a total effective dose equivalent not to exceed 0.25 mSv/yr (25 mrem/yr). Since the definition of "residual radioactivity" means radioactivity resulting from activities under the licensee's control and includes radioactivity from all licensed and unlicensed sources used by the licensee, then the licensee must meet this dose criterion for unrestricted release even if it has to remediate soils or materials that are less than 0.05 wt% source material.

In potential conflict with the LTR is 10 CFR 40.13(a), which states, "Any person is exempt from the regulations in this part and from the requirements for a license set forth in section 62 of the Act to the extent that such person receives, possesses, uses, transfers or delivers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than... 0.05 percent of the mixture, compound, solution or alloy." One interpretation of this regulation is that matter that contains less than 0.05 wt% source material (from licensed activities) remains part of the licensee's inventory of licensed material and does not become an "unimportant quantity of source material" until it is transferred to a person exempt from licensing requirements under 10 CFR 40.13(a) (i.e., a non-licensee). Also, the less than 0.05 wt% material left on site after decommissioning is considered residual radioactivity that is subject to the LTR. The other interpretation of 10 CFR 40.13(a) is that the licensee would be exempt from licensing under 10 CFR Part 40 if it removes from its site all matter that contains 0.05 wt% source material and greater. It follows that if the licensee becomes exempt from Part 40, the LTR would no longer apply.

2.2 Desired Outcome: The staff's desired outcome in the evaluation of this issue is to define and clearly describe the appropriate relationship between the LTR and 10 CFR 40.13(a) or resolve or eliminate the inconsistency between the regulations, if possible.

3. EVALUATIONS OF RELEVANT INFORMATION:

To define the appropriate relationship between the LTR and 10 CFR 40.13(a) and resolve the inconsistency between the two regulations, the staff considered the following cases and activities: the AAR proposal to use 10 CFR 40.13(a) as a decommissioning criterion (as laid out in SECY-01-0194); the ongoing Part 40 rulemaking for "Transfers of Certain Source Materials by Specific Licensees"; and the work of the Interagency Jurisdictional Working Group.

3.1 AAR's Proposed Use of 10 CFR 40.13(a) as Decommissioning Criterion (SECY-01-0194)

As noted above, SECY-01-0194 detailed AAR's proposal for use of 10 CFR 40.13(a) as a decommissioning criterion. AAR's opinion is that no further remedial action is required for soils that contain thorium in concentrations less than 0.05 wt% source material, as AAR asserted that this material is exempt from regulation, under 10 CFR 40.13(a).

The staff provided the reasoning for its opinion that 10 CFR 40.13(a) is not an appropriate decommissioning criterion, and that license termination and site release require that the criteria of the LTR must be met. The staff recommended that AAR's proposal be denied, arguing that AAR's decommissioning approach was inconsistent with the LTR and the SDMP Action Plan criteria, and that approval of AAR's approach would be inconsistent with the staff's general practice of holding non-licensees, with sites contaminated by licensed activities, to the same requirements of licensees. The staff also noted that if decommissioning is based on the percent of source material rather than a dose standard, a question arises as to whether it is permissible to reduce the concentration of source material in contaminated soils by adding clean soil to it.

In SRM-SECY-01-0194, the Commission approved the staff's proposal to deny AAR's request and require AAR to return to its approved remediation plan (consistent with the SDMP Action Plan criteria), meet the terms of the LTR voluntarily, or be subject to license, under which the

LTR would be applicable. Following the Commission's direction, the staff notified AAR, by letter dated August 9, 2002, of the U.S. Nuclear Regulatory Commission's (NRC's) decision that 10 CFR 40.13(a) was not an appropriate decommissioning criterion for the site and that AAR's decommissioning proposal had not been approved.

It is reasonable to expect that the staff opinions and arguments presented in SECY-01-0194 would extend to any site (licensed or formerly licensed, that was contaminated with source material from licensed activities) that proposed use of 10 CFR 40.13(a) as a decommissioning criterion.

3.2 Part 40 Rulemaking for "Transfers of Certain Source Materials by Specific Licensees"

Also in SECY-01-0194, the staff discussed the Commission's direction in the March 9, 2000, SRM on SECY-99-259, "Exemption in 10 CFR Part 40 for Materials Less than 0.05 Percent Source Material - Options and Other Issues Concerning the Control of Source Material." In SRM-SECY-99-259, the Commission directed the staff to initiate the development of a proposed rule to require prior Commission approval for transfers to persons exempt under 10 CFR 40.13(a), including transfers for the purposes of permanent disposal. The staff believed that the Commission's direction addressed transfer for the purposes of *off-site* disposal, such as at an industrial solid waste disposal facility or a hazardous waste disposal facility, and did not address *on-site* disposal [i.e., use of 10 CFR 40.13(a) as a decommissioning criterion]. To address this issue, the staff recommended in SECY-01-0194 that the proposed rule language and accompanying statement of considerations (SOC) be clarified to specify such "off-site" disposal.

In SRM-SECY-01-0194, the Commission approved the clarification in the proposed rule language and the accompanying SOC (as presented in SECY-00-0201, "Proposed Rule - 10 CFR Part 40 Amendments to Require NRC Approval for Transfers from Licensees to Exempt Persons,") to specify "disposal in an appropriate facility."

Based on the Commission's direction, the staff added language to the SOC of the proposed rule, which clarified NRC's intent that 10 CFR 40.13(a) not be used for on-site disposal [i.e., 10 CFR 40.13(a) should not be used as a decommissioning criterion].

> As part of this proposed rule, the Commission is also proposing to amend § 40.13(a) by adding the word "disposes" to the list of exempted activities in § 40.13(a). This addition would clarify the exemption's applicability to disposal. However, it should be noted that any **on-site disposal by a licensee of mixtures of material containing under 0.05 percent by weight (that was derived from its licensed material) source material is not addressed by § 40.13(a)** [emphasis added]. Any such disposal would continue to require approval under 10 CFR 20.2002 and be subject to reevaluation under the Decommissioning Timeliness Rule, 10 CFR 40.42 and the License Termination Rule, 10 CFR Part 20, Subpart E.

This proposed rule for "Transfers of Certain Source Materials by Specific Licensees" was published in the Federal Register on August 28, 2002 (67 FR 55175). The comment period for the proposed rule ended on November 12, 2002. The staff has reviewed the public comments received and is currently working to resolve the comments, to finalize this rule. As there were

no comments on this specific language, it is expected that this language would continue in the SOC for the final rule.

3.3 Interagency Jurisdictional Working Group

In SRM-SECY-99-259, the Commission directed the staff to initiate interactions and work with specified Federal agencies and the States to "... explore the best approach to delineate the responsibilities of the NRC and these agencies with regard to low-level source material (as defined in 10 CFR Part 40) or materials containing less than 0.05 percent uranium and/or thorium." The staff established an Interagency Jurisdictional Working Group (JWG) composed of representatives from the specified Federal agencies and the States. Since its establishment, the JWG has identified and examined a number of issues associated with 10 CFR 40.13(a), including problems involving inconsistency with NRC regulations [e.g., inconsistency between 10 CFR 40.13(a) and LTR].

As noted in an August 13, 2002, memorandum to the Commission, as a result of the JWG efforts, the staff is considering an approach to limit NRC authority to uranium and thorium that are purposely extracted or used. The staff will provide its analysis and recommendations regarding this issue in a separate Commission paper. The Commission should refer to the JWG paper for the staff's proposed recommendation, which requests approval to continue to evaluate the implementation of the JWG's recommended approach to limit NRC authority to uranium and thorium that are purposely extracted or used. The implementation of such proposal may include eliminating the exemption in 10 CFR 40.13(a), thus removing the inconsistency between the LTR and 10 CFR 40.13(a).

4. EVALUATION OF OPTIONS:

The staff's desired outcome in the evaluation of this issue is to define and clearly describe the appropriate relationship between the LTR and 10 CFR 40.13(a) or resolve/eliminate the inconsistency between the regulations, if possible. The staff believes that the above examples and considerations define the appropriate relationship between the LTR and 10 CFR 40.13(a) by demonstrating that 10 CFR 40.13(a) should not be used as decommissioning criterion, and that the LTR should.

In that regard, it should also be noted that the exemption in 10 CFR 40.13(a) stems from regulations adopted approximately 40 years ago, and the 0.05 wt% concentration 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 LTR was developed to provide specific radiological criteria for decommissioning, while the concentration in 10 CFR 40.13(a) was not developed or intended for this purpose. As noted in Section 3.3 above, the JWG has explored approaches to delineate the responsibilities of the NRC and various agencies with regard to low-level source material; the Commission should refer to the JWG Commission paper for a comprehensive discussion of the issues surrounding 10 CFR 40.13(a).

In reference to clearly describing the relationship and/or resolving the inconsistency between the two regulations, the staff believes that a resolution of the inconsistency is not a possibility at this time. As mentioned earlier in this paper, the staff is still considering the JWG's recommended approach to limit NRC authority to uranium and thorium that are purposely extracted or used.

The staff recognizes that implementation of this approach could include eliminating the exemption in 10 CFR 40.13(a). Although elimination of the exemption in 10 CFR 40.13(a) would obviously eliminate the inconsistency between 10 CFR 40.13(a) and the LTR, the staff does not believe this is a current possibility because: (1) the work of the JWG is driven by many other factors besides that of the LTR inconsistency; (2) the approval and the feasibility of implementing the JWG's recommendation are uncertain at this time; (3) if the staff recommends that the JWG recommendation be implemented and the Commission approves this approach, there are many more steps that need to be completed before any such rulemaking to eliminate the exemption in 10 CFR 40.13(a) could be implemented. If any of these steps are not successful, the recommendation may not ultimately be implemented; and (4) if the JWG recommendation is ultimately implemented, it will be a lengthy process.

Therefore, since the resolution of the inconsistency is not a current possibility, the staff proposes two options, regarding this issue: (1) Clarify NRC's policy that 10 CFR 40.13(a) should not be used as a decommissioning criterion, or (2) No action.

4.1 Clarify NRC's policy that 10 CFR 40.13(a) should not be used as a decommissioning criterion

Under this option, the staff would explain the appropriate relationship between 10 CFR 40.13(a) and the LTR in a regulatory information summary (RIS) that is readily available to wide ranges of stakeholders. The RIS would explain NRC's policy that 10 CFR 40.13(a) is not an appropriate decommissioning standard, and that the LTR provides the proper criteria for license termination.

Pros:

Although this relationship has been explored and addressed in several contexts (e.g., SECY-01-0194, 10 CFR 40.51 proposed rule, and the JWG), including clarification in a RIS could help to increase public confidence, as (1) a RIS has a broad distribution, and the overall LTR Analysis RIS would have high visibility, and (2) NRC's policy on this issue would be clearly established in one medium.

Clarifying the relationship between the LTR and 10 CFR 40.13(a) in a readily available public document would support NRC's performance goal of making the NRC activities and decisions more effective, efficient, and realistic, as it will clearly define NRC's policy on the issue, and thus alleviate future efforts of dealing with the issue.

The RIS could be prepared in a timely fashion, making it available for public and licensee use in the near term.

Cons:

Publishing NRC's policy in a RIS will not directly resolve the inconsistency. Although it is NRC's practice or policy that 10 CFR 40.13(a) is not an appropriate decommissioning criterion, the regulatory inconsistency between the LTR and 10 CFR 40.13(a) will remain unless the regulation is changed.

4.2 No Action

Under this option, the staff would not complete any actions to clarify the relationship between the LTR and 10 CFR 40.13(a). The staff would continue to evaluate any proposals for use of 10 CFR 40.13(a) as a decommissioning criterion, on a case-by-case basis, taking into consideration the Commission's direction on AAR and any Commission direction associated with this paper.

Pros:

The staff would not need to prepare a RIS for this issue.

Cons:

As mentioned earlier, the relationship between the LTR and 10 CFR 40.13(a) has been explored and addressed in several contexts (e.g., SECY-01-0194, 10 CFR 40.51 proposed rule, and the JWG). As the staff believes that these previous examples and considerations help define the appropriate relationship between the LTR and 10 CFR 40.13(a), it does not appear to be an effective and efficient use of resources to repeatedly continue to consider this issue on a case-by-case basis.

5.0 RECOMMENDATIONS:

As the elimination or resolution of the inconsistency between the LTR and 10 CFR 40.13(a) is not a current possibility, the staff recommends approval of Option 1 to clarify NRC's policy that 10 CFR 40.13(a) should not be used as a decommissioning criterion. This option could be implemented in a RIS.

RESULTS OF EVALUATIONS FOR APPROPRIATENESS OF DEVELOPING A SEPARATE UNRESTRICTED RELEASE STANDARD FOR URANIUM AND THORIUM

1.0 BACKGROUND

Source material (uranium and thorium) is found ubiquitously in nature. As a result, a number of facilities become NRC licensees because the ores (or materials) they use to produce other materials (e.g. rare earths) are naturally found combined with high concentrations of uranium and thorium or the uranium and thorium is inadvertently concentrated to above 0.05 percent by weight of source material during their process. These licensees, over the decades, have often accumulated large volumes of wastes that contain source material. These wastes eventually require decommissioning under NRC's regulations and have become some of the more problematic sites on the Site Decommissioning Management Plan (SDMP)/complex site list. Under the Licensing Termination Rule (LTR), NRC requires source material licensees to cleanup to levels, particularly for unrestricted release under 10 CFR 20.1402, that are potentially below the concentration levels that uranium and thorium are sometimes found elsewhere in nature and that persons not licensed (and sometimes general licensees) are free to use and dispose of under exemptions.

Compounding the difficulty of decommissioning these sites is the long half-life of uranium and thorium. Because the source material is expected to be present for much longer periods than most other radionuclides that NRC regulates, it is difficult to implement restricted release criteria under 10 CFR 20.1403 or alternate criteria under 10 CFR 20.1404 to ensure that any institutional controls will be maintained while the source material remains a risk. As a result, most source material sites have historically chosen to meet the unrestricted release criteria in 10 CFR 20.1402.

2.0 ISSUE DESCRIPTION AND DESIRED OUTCOMES

2.1 Issue:

The appropriateness of developing a separate unrestricted release standard for uranium and thorium at levels higher than those in 10 CFR 20.1402 is being considered given that : 1) source material specific licensees are currently required to cleanup sites where source material was used under license to levels that are potentially below concentration levels that uranium and thorium exist elsewhere in nature; 2) some of these sites have gathered large volumes of source material, making the cleanups both complex and costly - and, in some cases, threatening to bring the owners to bankruptcy; and 3) the unrestricted release standard in the LTR is, in many 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).

2.2 Eventual Desired Outcome:

Decide whether it is appropriate to develop a separate (from existing 10 CFR 20.1402) unrestricted release standard (either concentration or dose-based) for uranium and thorium and describe a clear relationship to other standards.

3.0 EVALUATIONS/CONSIDERATIONS

The staff examined a large 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 the this material. The evaluation included regulations and policies from NRC, other domestic sources, and from international activities related to uranium and thorium. Finally, the staff identified other issues that they believed should be considered in the evaluation.

3.1 Criteria in 10 CFR Part 20

The criteria found in 10 CFR Part 20 generally apply to the decommissioning of most NRC licensed material except as specifically noted in individual parts of the 10 CFR. This section focuses on the criteria in 10 CFR 20.1402, 20.1403, and 20.1404. The criteria in 10 CFR 20.1402 applies specifically to unrestricted use. 10 CFR 20.1403 provides criteria for restricted release and 10 CFR 20.1404 provides criteria for alternate criteria for license termination. These latter two sections are discussed because they can be used to potentially reduce licensee costs for cleanup, which is in part, one of the reasons to consider developing an separate unrestricted release criteria.

3.1.1 10 CFR 20.1402

10 CFR 20.1402 provides that a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem per year and is as low as reasonably achievable (ALARA). This criteria was selected because it is considered a fraction of the 100 mrem per year public dose limit and takes into consideration the potential for members of the public to be exposed to additional sources of radiation not directly related to the decommissioned site.

3.1.2 10 CFR 20.1403

10 CFR 20.1403 provides that a licensee may terminate its license under restricted use if it can be shown that: (1) further reductions in residual radioactivity would result in a net harm to public or environment and levels are ALARA; (2) any institutional controls are found to be legally enforceable and will provide reasonable assurance that the TEDE to the average member of the critical group will not exceed 25 mrem per year; (3) sufficient funding is provided by the licensee to enable a third party to carry out responsibilities for any necessary control and maintenance of the site; (4) the licensee has received input and advice from persons who may be affected; and (5) residual radioactivity at the site has been reduced such that if institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity to the

average member of the critical group does not exceed 100 mrem per year. A limit of 500 mrem per year for failed controls would be acceptable provided that additional reductions are either not technically achievable, prohibitively expensive, or would result in net public or environmental harm, and durable institutional controls are used.

3.1.3 10 CFR 20.1404

10 CFR 20.1404 provides that the Commission may terminate a license using alternate criteria greater than the dose criterion in 10 CFR 20.1402, 20.1403(b), and 20.1403(d)(1)(i)(A), if the licensee: (1) provides assurance that public health and safety would continue to be protected and it is unlikely that the dose from all man-made sources combined would be more than 100 mrem per year; (2) has employed to the extent practical restrictions on site use to minimize exposures; (3) has reduced doses to ALARA levels; and (4) has sought input and advice from persons who may be affected by the decommissioning. The use of this option requires approval of the Commission after consideration of the NRC staff's recommendations that must address any comments provided by EPA and any public comments submitted pursuant to 10 CFR 20.1405.

10 CFR 20.1404 was implemented due to a realization that a small number of sites may not be able to reasonably terminate their licenses under either 10 CFR 20.1402 or 20.1403. Rather than seeking an exemption for such situations, this section was codified to provide licensing efficiency and consistency of application of requirements to account for the few difficult sites that were expected to present unique decommissioning problems. The staff, however, believed that the vast majority of cleanups should be able to be completed under 10 CFR 20.1402 or 20.1403.

3.2 Criteria in 10 CFR Part 40

NRC regulates source material under 10 CFR Part 40. The staff identified five sections that provide for the use of source material in a potentially unrestricted manner that may result in exposures that are potentially higher than what the LTR permits for unrestricted use under 10 CFR 20.1402. These sections and a description of each can be found below.

3.2.1 10 CFR Part 40, Appendix A

10 CFR Part 40, Appendix A provides unrestricted release criteria for 11e.(2) byproduct material (i.e., mill tailings) only. In criterion 6(6), the unrestricted release limit for residual radionuclides, other than radium, is based on the site-specific dose for radium (using sum of fractions in any 100 m^2), e.g., 5 pCi/g Ra-226 +ALARA averaged over the first 15 centimeters (cm) below the surface or 15 pCi/g Ra-226 +ALARA when averaged in 15 cm layers below the first 15 cm, and if it exceeds 100 mrem/yr, it will require Commission approval. It should be noted that equivalency approach in criterion 6(6) is based on the idea that uranium and thorium would contribute only a small component of the overall dose since most source material had been previously extracted and thorium-230 would generally be removed with the radium-226. Additionally, the 1999 rulemaking that added criterion 6 (6) expected that the areas contaminated with U and Th alone or remaining elevated after remediation for Ra-226 would be small areas at a limited number of relatively isolated sites where these licensees are generally found.

3.2.2 10 CFR 40.13(a)

10 CFR 40.13(a) provides an exemption to allow any person to receive, possess, use, transfer or deliver source material at levels below 0.05 percent by weight. However, at this limit, some calculated scenarios have indicated that doses could potentially exceed the unrestricted use criterion in 10 CFR 20.1402. As a result, this exemption allows a person to process large quantities of materials containing concentrations of uranium and thorium just under this limit without a license and freely dispose of the wastes at higher concentration levels than a licensee would be permitted to keep onsite for an unrestricted release under 10 CFR 20.1402. This results in the inconsistency that a licensee may have to clean up to considerably lower levels than its non-licensed "neighbors" for what is essentially the same material. Finally, the staff is hesitant to lower the concentration in this exemption because it could bring under NRC's regulation, a large number of industries that Congress may not have intended NRC to regulate (e.g., petroleum industry, water treatment facilities, etc.).

3.2.3 10 CFR 40.13(b)

10 CFR 40.13(b) is an exemption that allows any person to receive, possess, use, transfer or deliver unrefined and unprocessed source material, provided that they do not process or refine such ore without a specific license. For example, a person could move high concentrations of natural uranium and thorium from place to place (including use as backfill) and still be exempt from the requirements of 10 CFR Part 40. As a result, this exemption could result in exposures above the unrestricted use criterion in 10 CFR 20.1402 for any high concentrations of uranium and thorium that may sometimes be found in nature.

3.2.4 10 CFR 40.22

10 CFR 40.22 provides institutions and firms a general license to hold or transfer up to 15 pounds of source material at any one time (this would be equal to 30,000 pounds of material at 0.05 percent level) and receive up to 150 pounds per year. Persons operating under this general license are exempted from the regulations in 10 CFR Parts 19, 20, and 21, including the requirements in the LTR. Thus, the source material could conceivably result in exposures that exceed the unrestricted use criteria in 10 CFR 20.1402. It should be noted, however, that the State of Colorado petitioned to have this changed in 1999 due to finding a site severely contaminated after a general licensee abandoned it. Doses were calculated by the State to potentially exceed 100 mrem per year. In April 2001, the staff submitted a rulemaking plan to the Commission (SECY-01-0072) which would, in part, have the staff address that State of Colorado's petition by reexaming the exemptions to 10 CFR Parts 19, 20, and 21, as currently stated in 10 CFR 40.22. As a result, some of these general licensees may eventually have the LTR apply to them or may become specific licensees. The staff is currently awaiting Commission direction on the rulemaking plan.

3.2.5 10 CFR 40.51

10 CFR 40.51 allows a source material licensee to transfer material to a person exempt under the regulations. The current language in the regulations can be interpreted to allow licensees to move source material under 0.05 percent off site without restriction or notification to NRC, including for purposes of disposal on a neighboring unlicensed site. However, NRC is not aware

of this occurring in the past and has released stated positions, despite the wording in the regulation, that would indicate this practice is not permitted. To better clarify this position, the SRM to SECY-00-0201 directed staff to implement a rule to require approval from NRC prior to any such transfer. The SRM also gave staff permission to authorize transfers for disposal in appropriate facilities (i.e., RCRA or State permitted sites) up to 25 mrem per year, keep the Commission informed of approvals given for disposals up to 100 mrem per year, and even kept open the possibility of higher exposures in unique circumstances with appropriate Commission review. However, because these appropriate facilities are expected to have some type of long-term government oversight, they might be viewed similar to sites falling under 10 CFR 20.1403 or 10 CFR Part 61.

3.2.6 Conclusion

Based upon the review of existing NRC regulations, it appears that there are large discrepancies between each regulation as to when and at what level NRC regulates source material. Each regulation above may result in calculated doses that exceed the unrestricted use criteria in 10 CFR 20.1402 for equivalent scenarios. Some inconsistencies are a result of constraints in the Atomic Energy Act and the belief that Congress did not intend NRC to regulate a large number of industries not related to the nuclear fuel cycle. However, the staff is currently reevaluating many of these regulations to determine if any adjustment is necessary.

3.3 Other Domestic Regulations/Guidance Related to TENORM or Uranium and Thorium

Other domestic federal and state agencies, as well as industry groups have also developed or proposed regulations or guidance related to unrestricted release criteria for naturally occurring radioactive material (NORM) and TENORM. These regulations were considered because uranium and thorium in nature is considered NORM although often radionuclides other than uranium and thorium are the more significant hazard. This section summarizes the proposed or existing criteria that were identified.

3.3.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA is a risk based standard that covers radionuclides and was issued by EPA. Cleanup of radionuclides are governed by the risk range (generally 10^{-4} to 10^{-6}) for all carcinogens established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) when applicable or relevant and appropriate requirements (ARARs) are not available or are not sufficiently protective. An August 22, 1997, memorandum from EPA (OSWER No. 9200.4-18) includes a determination that dose limits in NRC decommissioning rule (e.g., 25/100 mrem/yr) should generally not be used to establish cleanup levels under CERCLA. However, EPA has provided exceptions, by using ARARs, that might permit resulting doses to exceed 25 mrem per year. Additionally, doses associated with any material covered by an ARAR are not recalculated nor added to other materials present to compare with the EPA risk range.

3.3.2 EPA Use of ARARs

Section 121(d) of the CERCLA requires attainment of federal and state applicable or relevant and appropriate requirements. The NCP describes the process for attaining these ARAR requirements. In evaluating the relevance and appropriateness of a requirement, eight

comparison factors in 40 CFR 300.400(g)(2) are considered. Once a requirement is determined to be relevant and appropriate, it must be complied with as if it were applicable. EPA has issued some ARARs related to the cleanup of sites containing uranium and thorium using 40 CFR 192 and Appendix A of 10 CFR Part 40 (see OSWER Directives 9200.4-25 and 9200.4-35P, respectively), both of which would allow exposures comparable to those resulting from 5 pCi/g radium-226. However, these ARARs are based on Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) and clearly state that they are meant for sites which have soil contamination that is very similar to sites covered by UMTRCA (meaning not having significant concentrations of uranium and thorium that result in a equivalent dose of radium-226 contamination in the range of 5 to 30 pCi/g). Criterion 6(6) of Appendix A of 10 CFR Part 40 was to only be used infrequently and benchmarking was to be incorporated by only using EPA methodology in conjunction with the 5 pCi/g limit (and then it was acceptable only if it resulted in doses generally below 15 mrem per year).

3.3.3 NRC/EPA Memorandum of Understanding Concentrations

On October 9, 2002, the U.S. Nuclear Regulatory Commission (NRC) signed a Memorandum of Understanding (MOU) with the U.S. Environmental Protection Agency (EPA) on the radiological decommissioning and decontamination of NRC-licensed sites. Since 1983, EPA has generally deferred listing NRC licensed sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This deferral policy, however, did not extend to previously licensed NRC sites, leaving the possibility of dual regulation (i.e., an NRC licensee could potentially remediate to NRC's license termination criteria, and then have to perform subsequent cleanup to separately comply with EPA's CERCLA requirements). The MOU was developed in response to this general concern.

The MOU reaffirms EPA's 1983 policy and expands EPA's deferral to sites for which the NRC license is terminated and certain criteria are met. The MOU provides that unless an NRC licensed site exceeds any of three "trigger" criteria at the time of license termination, EPA does not expect to exercise its CERCLA authority before or after termination of the NRC license. The three criteria provided in the MOU are: (1) radioactive ground-water contamination above EPA's Maximum Contaminant Levels; (2) radioactive soil concentrations exceeding the values provided in Table 1 of the MOU; and, (3) license termination under either restricted release or alternate criteria. According to the MOU, if NRC determines during the license termination process, that any NRC licensed sites meet/exceed any of the trigger criteria, NRC will consult with EPA.

Note that the soil concentration values provided in the MOU are not “cleanup” levels for either NRC or EPA; rather they are just trigger values for consultation between the two agencies. The soil concentrations in the MOU for radium-226 and thorium-232 (5 pCi/g) are based on soil standards developed under UMTRCA and EPA’s implementing standard in 40 CFR 192. The soil concentrations (mg/kg) for total uranium were calculated by EPA and are based on a noncarcinogenic hazard index quotient of 1. The remainder of the soil concentrations were calculated by EPA based on a 1×10^{-4} cancer risk.

3.3.4 CRCPD Subpart N

The Conference of Radiation Control Program Director, Inc. (CRCPD) has proposed regulations related to the regulation of TENORM in Subpart N of their regulations. Under Subpart N, the unrestricted release criteria for radium on land, averaged over 100 square meters, is to not

exceed 5 pCi/g above the background concentration, averaged over any 15 cm layer of soil. Exposures from other TENORM nuclides are proposed to be limited to 25 mrem per year. This criteria for other TENORM nuclides is consistent with the unrestricted use criteria found in 10 CFR 20.1402. However, Subpart N does propose to exempt some TENORM (such as fertilizers).

3.3.5 ANSI N13.53

ANSI has proposed guidance related to TENORM and source material under ANSI N13.53. For disposals, 25 mrem per year is proposed for residual radioactivity (excluding radon and progeny which are 20 Bq/m^3 outdoors and 150 Bq/m^3 indoors). This is consistent with the unrestricted use criteria found in 10 CFR 20.1402. However, the guidance also provides exemptions for fertilizers, natural construction materials, and fossil fuels.

3.3.6 States

Some individual States have developed TENORM regulations related to disposal. These regulations include criteria based upon concentrations of Ra-226 (ranging from 5 pCi/g [most] to 30 pCi/g Ra-226 [New Mexico]). Some have implemented annual exposure limits that range from 15 mrem to 100 mrem per year (although higher levels are often allowed for low-radon emanation materials). The State of Arkansas limits soil disposals for uranium and thorium up to 0.05 percent by weight. However, many of these regulations exempt one or more specific industries or products.

3.3.7 Summary

Although these regulations and guidance are similar to the unrestricted use criteria found in 10 CFR 20.1402, many of these agencies and groups have provided exemptions or exceptions for certain industries which could lead to higher exposures. The rationale for these higher exposures may be based on a cost-benefit approach that the societal benefit of limiting regulation on the material may outweigh the radiation associated risks and the practicality to control the materials.

3.4 International Activities Using Separate Criteria for U/Th

Although not directly related to disposal criteria, it should be noted that the International Atomic Energy Agency (IAEA) has developed a draft safety guide entitled, “Draft Safety Proposed Specification of Radionuclide Content not Requiring Regulation for Purposes of Radiation Protection (DS-161).” The IAEA draft safety guide uses different approaches to set limits for "artificial radionuclides" (i.e., produced by reactor or accelerator) versus naturally occurring radionuclides. The IAEA draft safety guide could also be considered for the control of solid materials. The draft document argues that if criteria for NORM is derived on the basis of radiological criteria for other isotopes, the values will, in many cases, be lower than concentrations that occur in many natural materials. Thus many activities previously unregulated from a radiological standpoint, such as construction of houses from natural building materials or even the use of land in many areas, could be subject to regulation. The IAEA proposes that a level needs to be set where the number of materials involved should not be so great as to make regulation unmanageable or unlikely to improve protection.

This approach is different from the one limit for all radionuclides used in NRC's LTR.

3.5 Other Considerations

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 may affect the future number of source material licensees, the use of existing regulations to reach the goal of allowing licensees to cleanup at reasonable cost, differences between source material and other radioactive materials, and the possible impacts from having a separate standard. These items are discussed below.

3.5.1 Number of Licensees Impacted

The number of licensees that are finding it unacceptably difficult to decommission to the levels required under 10 CFR 20.1402 are relatively few. Although many licensees may benefit from the cost savings resulting from the implementation of a separate unrestricted release criteria for source material at a higher level than allowed in 10 CFR 20.1402, most source material licensees use source material in solid forms (as metals or as shielding) and as thus would see little or no benefit to higher unrestricted release criteria. Currently, the staff has identified eighteen SDMP or complex source material sites that are contaminated with uranium and/or thorium. Of these sites, fourteen have submitted decommissioning plans for unrestricted release, while four sites are contemplating pursuing restricted release (two already have plans under review). Of these eighteen sites, only four sites are currently not scheduled to be decommissioned by January 2007. As a result, by the time a rulemaking to create a separate unrestricted release standard could be implemented, many of these sites could be completed with decommissioning. Additionally, the staff has some concerns that many of these sites currently undergoing decommissioning may push to slow down their processes if any rule is pondered in the public forum in order to achieve potential cost savings that higher decommissioning criteria may allow. Finally, the staff does not foresee there being more than a few additional operating or proposed operations that may also be considered as complex sites in the near future. Although rule changes proposed in SECY-01-0072 could increase the number of source material specific licensees in the future, these new licensees would not be expected to create new complex decommissioning sites.

3.5.2 10 CFR Part 40 Interagency Jurisdictional Working Group

In a March 9, 2000, SRM to SECY-99-259, the Commission directed the staff to initiate interactions and work with specified Federal agencies and the States to "explore the best approach to delineate the responsibilities of the NRC and these agencies with regard to low-level source material (as defined in 10 CFR Part 40) or materials containing less than 0.05 percent uranium and/or thorium." The staff established an interagency Jurisdictional Working Group (JWG) composed of representatives from the specified Federal agencies and the States. As noted in an August 13, 2002, memorandum to the Commission, as a result of the JWG efforts, the staff is considering an approach to limit NRC authority to uranium and thorium that are purposely extracted or used. The memorandum described the further evaluations that needed to be completed before the staff could make a recommendation to the Commission.

In a separate paper entitled, “Interagency Jurisdictional Working Group Evaluating the Regulation of Low-Level Source Material or Materials Containing Less Than 0.05 Percent by Weight Concentration Uranium and/or Thorium,” the staff will provide additional findings to the Commission. As part of this paper the staff will recommend that the Commission continue consideration of limiting NRC authority to uranium and thorium that are purposely extracted. The staff proposes to formally request responses from other Agencies regarding the approach, as well as contacting other agencies regarding other related issues (such as impact on international treaties, etc.). The staff believes that in order to make the recommendation more acceptable to the States and to not interrupt ongoing cleanup activities, source material SDMP sites, and potentially other complex existing source material sites, would likely remain under NRC’s jurisdiction despite whether they originally purposely extracted or used uranium and thorium or not.

If the NRC jurisdiction of non-purposefully-used uranium and thorium is transferred to other agencies, the number of existing NRC and Agreement State sites licensed under the AEA, and potential future licensees, would be reduced. However, because the staff believes that it may be necessary to retain the SDMP sites and possibly other complex sites under NRC jurisdiction, the recommendation of the JWG will have little or no reduction in the number of sites that would benefit from a separate unrestricted standard from what was discussed in the previous section (Section 3.5.1).

3.5.3 Use of Existing Regulations to Allow Source Material Licensees to Reduce Cleanup Costs (through greater use of 10 CFR 20.1403 and 20.1404, as well as exemptions)

10 CFR 20.1403 or 10 CFR 20.1404 have not been significantly used by licensees as cleanup criteria to date. These sections, however, are available for use by licensees and the staff believes they provide regulatory flexibility and the potential for cost reductions while maintaining public health and safety. These sections effectively rely on a graded approach based on risk. As such, the licensee has a choice of cleaning up to unrestricted use (under 10 CFR 20.1402) or pursuing a restricted use (under 10 CFR 20.1403) if an unrestricted release is not feasible. Furthermore, in the rare circumstances that the criteria under 10 CFR 20.1402 or 20.1403 could not be met, the licensee could pursue alternative criteria, possibly resulting in higher exposure limits, through the use of 10 CFR 20.1404. Evaluations completed under 10 CFR 20.1403 or 20.1404 would be more involved and rely on risk evaluations to determine appropriate dose constraints and restrictions. Finally, if none of the above criteria fit a unique condition of the site, an exemption could be sought under 10 CFR 20.2301. The staff is considering development of guidance that would make these regulations more practical for both the staff and licensees to use (see Attachment 1 of “Results of the License Termination Rule Analysis”).

The benefit of pursuing the use of existing regulations is that it would take into account the specific circumstances associated with each licensee’s site and conditions. In contrast to development of a separate unrestricted release criteria, which would allow all source material licensees to likely exceed the criteria in 10 CFR 20.1402, the use of existing regulations allows the staff to use cost/benefit and risk evaluation to establish criteria and restrictions, as necessary, that may exceed the criteria in 10 CFR 20.1402; those licensees who can readily meet the criterion in 10 CFR 20.1402 will continue to be required to do so. The use of the existing regulations would not require the resources necessary to develop a separate

unrestricted release criteria for source material, nor place additional burden on Agreement States to potentially change their regulations to maintain appropriate compatibility levels.

3.5.4 Properties of Uranium and Thorium

Uranium and thorium are found ubiquitously in nature, whereas the origination of any byproduct material is the result of a man-made intervention (i.e., produced by reactor or accelerator). Therefore, for uranium or thorium, generally considered as part of background in its place of origin, there is always a risk associated with the material whether or not the material is used; however, the movement and use of the source material can change the risk of exposure to specific populations. This is in contrast to 11e.(1) byproduct material, which increases the risk of exposure to all populations because it creates a new source of radiation upon its creation. As a result, although difficult to quantify, one can argue that setting an equal level for decommissioning criteria does not reduce risk equally between uranium and thorium versus other radionuclides.

Another consideration is the half-life of uranium and thorium. Source material has a half-life that is considerably longer than most other radionuclides. This, however, is countered by the relatively low specific activities associated with the uranium and thorium when compared to 11e.(1) byproduct material. The longer half-life makes it more difficult to model alternative disposals, because of the longer period that must be considered during which exposure conditions may change. If institutional controls are found necessary for some sites, evaluating the effectiveness of such controls in perpetuity may be difficult. Although allowing a higher unrestricted release criteria than currently exists would certainly be of benefit to persons using source material, consideration will need to be given to the fact that the disposition of the material will effectively result in a permanent potential exposure hazard while the material remains there (however, any such exposure level would still be considered protective of the environment and human health and safety).

3.5.5 Consistency in Dose Levels and Public Confidence

One of the most difficult areas that requires consideration is the impact on public confidence resulting from having more than one cleanup level. Many members of the public may become concerned about any regulation that appears to reduce their perceived safety and, as a result, developing a separate unrestricted release standard for source material will be difficult from the start. The public may be confused how NRC can consider exposures from uranium and thorium to be safe, while, at the same time, ensuring safety at a likely lower exposure level for other radionuclides. However, as shown in Section 3.1, there are already a number of potential "unrestricted use" levels that NRC (and the public to an extent) already accept as protective of safety; thus, any impact on public confidence from the development of separate criteria might be minimal. Additionally, although it may appear to the public that it is appropriate to provide consistency in dose limits for different practices (and maybe same practice/different radionuclides), it can be considered to be inconsistent in cost/benefit evaluation and risk-informing (e.g. there may be more societal benefit to allow a certain practice to provide public exposures at a higher level versus another, including for disposal). As a result, it is important to make it clear to the public that exceeding a practice-specific limit does not necessarily create an unsafe condition (although any cost-benefit evaluation would need to incorporate NRC's current policy to protect against the possibility of receiving multiple exposures over time).

3.6 Summary

Based on the evaluation of the information above, it can be concluded that the LTR has important differences from other Part 40 regulations that make a simple comparison of the criteria complicated. The basis assumed for each regulation, such as the amount of material, licensing status of material, impact on other industries, etc., needs to be considered when making the comparison. Additionally, it is important to realize that some of the NRC regulations (e.g., 10 CFR 40.22 and 10 CFR 40.51) are currently being reevaluated to determine if they should include requirements that are more in line with the criteria in the LTR. In regards to regulations developed by other domestic sources, most are relatively equivalent to the criteria found in 10 CFR 20.1402; however, many also provide exemptions or exceptions for classes of material or industries which would possibly create scenarios that result in exposures at levels higher than the constraints found in 10 CFR 20.1402. Notwithstanding existing regulations, there are a number of other considerations the staff believes impact the need for separate criteria. There are differences in properties of uranium and thorium versus other radionuclides that NRC regulates, which can be used as a basis to support separate criteria. However, without a detailed cost/benefit analysis, it is unclear that the limited number of licensees that may need criteria beyond the criteria in 10 CFR 20.1402 warrants the development of a separate unrestricted release criteria for source material.

4.0 EVALUATION OF OPTIONS

Two primary options were considered: (1) establish a separate unrestricted release standard for source material, or (2) do not establish a separate unrestricted release standard for uranium and thorium.

4.1 Establish a Separate Unrestricted Release Standard for Source Material

Under this option, the staff would establish, through rulemaking, a separate unrestricted release standard for source material at a level that could result in exposures higher than currently allowed under 10 CFR 20.1402. As a result, all source material licensees would have the opportunity to cleanup to this higher constraint, although ALARA would still be expected to apply. This would require the development of rulemaking language, a regulatory analysis, and either an environmental assessment (EA) or environmental impact statement (EIS), as well as established processes for public participation. The criteria could be based on numerous existing standards for NORM, criterion 6(6) in Appendix A, or some other basis.

4.1.1 Pros

This option provides a separate unrestricted release standard for source material, which, although still considered protective of health and safety, may be higher than the unrestricted release criteria in 10 CFR 20.1402 and should, therefore, reduce the burden for cleanup for all source material licensees. Further, by cleaning up to an unrestricted release, it would allow greater flexibility in the future use of the site. In contrast to the use of restrictions, the use of a defined higher unrestricted release standard for source material would presumably allow for a straight forward review process for both licensees and staff to allow some of the more complex sites to cleanup. Additionally, compared to restricted releases, no additional burden would be necessary to ensure any restrictions are maintained.

4.1.2 Cons

This option would potentially allow exposures at higher levels than permitted in 10 CFR 20.1402 while not providing any of the possible reductions in exposure that restrictions may allow; thus the public may view this as a reduction of safety over current practice. Because a generic standard may need to be set as high as a criterion instituted under a case-by-case review of unique circumstance, because it needs to account for a broader range of conditions, some of the more complex sites may still find it more cost effective to use 10 CFR 20.1403 or 10 CFR 20.1404 as provisions for cleanup. Additionally, a new separate unrestricted release standard would permit licensees who would have had no problem cleaning up under 10 CFR 20.1402 to cleanup to the higher unrestricted release standard (after considerations of ALARA); this would result in the potential for higher exposures at more sites than just the complex/SDMP sites of concern. The implementation of this option would require additional rulemaking and guidance to be developed by NRC and Agreement States resulting in costs to both groups. Finally, because of the duration of the rulemaking process, many of the SDMP/complex sites may already be on a schedule to complete decommissioning prior to implementation of a final rule reducing the rule's usefulness; however, because some sites may opt to defer further decommissioning until the rule is completed in the hopes of reducing decommissioning costs overall, timeliness in cleanup of existing sites could also be impacted.

4.2 Do Not Establish a Separate Unrestricted Release Standard for Uranium and Thorium

Under this option, all source material licensees would continue to be required to decommission their sites to meet the criteria in 10 CFR 20.1402, 20.1403, and 20.1404. The use of 10 CFR 20.1403 and 20.1404 would require case-by-case review of both restrictions and criteria proposed by the licensee and development of associated EAs or EISs.

4.2.1 Pros

The current level of protection of the environment and public health and safety would not change. Source material licensees who can meet the current unrestricted release criterion would continue to be required to meet 10 CFR 20.1402 instead of a higher generic level that might be instituted under a separate unrestricted release criterion. Because continued use of the LTR would provide a consistent basis for all specific licensees independent of the type of material, it should not create any public confusion about release criteria. The benefit of pursuing the use of existing regulations is that it would take into account the specific circumstances of each licensee's site-specific conditions to tailor what appropriate criteria was necessary and what restrictions, if necessary, were appropriate. No additional rulemaking would be necessary by NRC and only guidance would need to be revised or developed. Finally, the continued use of the LTR would not require the resources necessary to develop a separate unrestricted release criterion for source material, nor place additional burden on Agreement States to potentially change their regulations to maintain compatability levels.

4.2.2 Cons

This option would continue to require licensees to dispose of source material at levels that may be lower than what "neighboring processes" might use under exemption or general license; this

may be confusing to the public to a certain extent as to why NRC regulations do not provide exactly the same restrictions throughout. It would not reduce current levels of burden on all source material licensees that a separate criteria may. Because the staff may rely more on restricted releases to allow a reduction in cleanup costs, NRC resources (or other independent party resources) may need to continue to be spent into the foreseeable future to ensure that any restrictions remain in place. In addition, although the licensee is required to provide adequate funding for maintaining those restrictions, it may be difficult for staff to estimate what those future costs may be. Finally, the staff will need a separate Commission review for each cleanup completed under 10 CFR 20.1404 which may not be as efficient as could be completed under an Commission approved separate standard.

5.0 RECOMMENDATIONS

The staff acknowledges that there are some significant inconsistencies in the potential exposures allowed between 10 CFR 20.1402 and other regulations in 10 CFR Part 40. Although the staff is reevaluating some of these 10 CFR Part 40 regulations, the staff does not believe that they are applicable as unrestricted release criteria for source material specific licensees.

The staff has also found that there are only a limited number of existing source material sites that have not already sought unrestricted release that may find it necessary to cleanup to requirements other than those in 10 CFR 20.1402. If NRC jurisdiction of non-purposefully-used uranium and thorium is transferred to other agencies, as discussed in the JWG's paper, the number of existing NRC and Agreement State source material sites licensed under the AEA, and potential future licensees, would be further reduced. However, because the staff believes that it may be necessary to retain the SDMP/complex decommissioning sites under NRC jurisdiction, the recommendation of the JWG will not result in a significant reduction in the number of overall sites that would benefit from a separate unrestricted standard.

In summary, the staff believes that the opportunity provided by the existing LTR allows complex source material sites the flexibility to reduce burden through a graded approach (unrestricted use to restricted use to alternate criteria) that can be based on risk. Continued use of the LTR would also 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. As a result, the staff believes that given the flexibility in the existing regulations in 10 CFR 20.1402, 20.1403, and 20.1404,and in conjunction with the limited number of sites that may require cleanup to criteria other than those in 10 CFR 20.1402, it is not appropriate at this time to develop a separate unrestricted release standard for source material licensees. This issue should be discussed in a RIS.

RESULTS OF EVALUATION FOR RELATIONSHIP BETWEEN LTR AND
ON-SITE DISPOSAL UNDER 10 CFR 20.2002

1. BACKGROUND

The U.S. Nuclear Regulatory Commission (NRC) has the authority to approve on-site disposals under 10 CFR 20.2002. This regulation does not establish a clear standard for approval, but allows Agency discretion, on a case-by-case basis, as long as the action remains within the public dose limit of 1 millisievert/year (mSv/yr) [100 millirem/year (mrem/yr)]. Specifically, the rule requires licensees to demonstrate how they meet the dose limit in 10 CFR Part 20. The public dose limit in 10 CFR Part 20 is 1 mSv/yr (100 mrem/yr), whereas the "Statement of Considerations" for the License Termination Rule (LTR) explains that 0.25 mSv/yr (25 mrem/yr) in the LTR is a dose constraint. On-site disposals must be reconsidered at the time of license termination, and the LTR unrestricted release dose constraint at that time is 0.25 mSv/yr (25 mrem/yr) and as low as is reasonably achievable (ALARA). Furthermore, as the Timeliness Rule in 10 CFR 30.36, 40.42, and 70.38 also applies to on-site disposals, licensees may have to reevaluate the dose contribution of approved on-site disposals, before license termination.

This issue was identified in SECY-02-0177, along with the planned evaluation that is addressed in this attachment. This attachment examines NRC's current practice for approving on-site disposals, NRC's practice for applying the Timeliness Rule to on-site disposals, and considers options for evaluating future on-site disposal requests.

2. ISSUE DESCRIPTIONS AND DESIRED OUTCOME

2.1 Issue

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 within the public dose limit of 1 mSv/yr (100 mrem/yr). However, it appears clear, from the LTR "Statement of Consideration," that on-site disposals were to be reconsidered under the LTR 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. Similarly, the same constraint should be used for offsite disposals, under 10 CFR 20.2002.

2.2 Desired outcome

Clarify the appropriate standard to use for approving on-site disposals.

3. EVALUATIONS OF RELEVANT INFORMATION

3.1 Current Practice for Approving On-Site Disposals

By its terms, 10 CFR 20.2002 does not establish a specific standard for approving on-site disposal applications. Staff's current practice for approval of on-site disposals is the dose criterion of a "few millirem" This practice is consistent with the following considerations:

1) Under 10 CFR 20.2002, NRC could permit on-site disposals of up to 1 mSv/yr (100 mrem/yr), based on the public dose limit provided in 10 CFR 1301(a);

2) The "Statement of Considerations" for the LTR, state that disposals will be considered at the time of license termination [i.e., as a contribution to the total dose at the site, which is 0.25 mSv/yr (25 mrem/yr) and ALARA for unrestricted release)]; and,

3) 10 CFR 20.2002(d) provides that on-site disposals must be implemented in a manner that provides for doses that are ALARA.

Staff's current practice is a fraction of the upper-limit of 1 mSv/yr (100 mrem/yr), consistent with the LTR "Statement of Considerations" (in that staff believes that when the disposal is considered at the time of license termination, as suggested in the "Statement of Considerations," the contribution of a "few millirem" should not require remediation of the disposals), and supports the ALARA provision of 10 CFR 20.2002.

3.2 Current Practice for Applying the Timeliness Rule to On-Site Disposals

The Timeliness Rule provides requirements for 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, such as nuclear reactors.

NRC regulations provide that the Timeliness Rule applies to separate outdoor areas where no principal activities are conducted for 24 months. 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 rule to include on-site disposals. Specifically, staff interprets inactive on-site disposals as areas where no principal activities are occurring. Guidance documents addressing the applicability of the Timeliness Rule to disposals include:

1) NRC Administrative Letter 96-05, "Compliance with the Rule of Timeliness in Decommissioning of Material Facilities" (May 11, 1996, and Rev. 1, dated July 14, 1998);

2) NRC Information Notice 96-47, "Recordkeeping, Decommissioning Notifications for Disposals of Radioactive Waste by Land Disposal Authorized under Former 10 CFR 20.304, 20.302, and Current 20.2002" (August 19, 1996);

3) NRC Regulatory Issue Summary 2000-09, "Standard Review Plan for Licensee Requests to Extend the Time Periods Established for Initiation of Decommissioning Activities" (June 26, 2000);

4) NRC NUREG 1757, Vol. 1, "Consolidated NMSS Decommissioning Guidance" (September 2002); and,

5) NRC NUREG 1757, Vol. 3, "Consolidated NMSS Decommissioning Guidance-DRAFT" (December, 2002).

4. EVALUATION OF OPTIONS

The staff evaluated the following five options for approving on-site disposals: (1) a dose criterion of 1 mSv/yr (100 mrem/yr); (2) a dose criterion of 0.25 mSv/yr (25 mrem/yr); (3) continuing the current practice of a "few millirem"; (4) limiting approvals to disposals of short-lived radionuclides; and (5) entirely discontinuing the practice of approving on-site disposals. An evaluation of each alternative follows. This evaluation focuses on the balance between the countervailing policy considerations of reducing regulatory burden, and therefore increasing licensee cost savings and flexibility, and staff's current objective of preventing future legacy sites.

4.1 Use a Dose Criterion of 1 mSv/yr (100 mrem/yr) for Approving On-Site Disposals

Under this option, staff would review 10 CFR 20.2002 on-site disposal requests against a dose criterion of 1 mSv/yr (100 mrem/yr).

Pros:

This policy would provide licensees with the most flexibility permissible under the current regulation.

This dose criterion is permissive under 10 CFR 20.2002

Cons:

This option may not further staff's objective of preventing future legacy sites. Since disposals must be considered at the time of license termination, a disposal that meets the 1mSv/yr (100 mrem/yr) dose criterion at the time of disposal, may contribute over 0.25 mSv/yr (25 mrem/yr) to the site-wide dose at the time of license termination. This option could therefore result in sites with on-site disposals that require remediation before unrestricted release can be achieved under the LTR. Similarly, this option could unnecessarily force a restricted release option, which is not the Commission's preferred license termination option. If restricted release is impractical and licensees do not have the funding to perform additional remediation for such disposals, this approach may ultimately lead to the creation of legacy sites. Therefore, staff may want to consider approving requests under this criterion, subject to licensees obtaining additional financial assurance for remediation of the on-site disposal.

Since disposals at material sites are considered under the timeliness rule, an approval of a disposal over 0.25 mSv/yr (25 mrem/yr) may require an alternative schedule request, an exemption from the Timeliness Rule, or remediation within 2 years.

4.2 Use a Dose Criterion of 0.25 mSv/yr (25 mrem/yr) for Approving On-Site Disposals

Under this option, staff would review 10 CFR 20.2002 on-site disposal requests against a dose criterion of 0.25 mSv/yr (25 mrem/yr).

Pros:
This approach is consistent with the criteria for unrestricted release under the LTR, and therefore gives licensees the flexibility to request on-site disposals up to that level.

Cons:
This policy is more restrictive and burdensome on licensees than 1 mSv/yr (100 mrem/yr), which is permissive under 10 CFR 20.2002. However, depending on the economics, there may be a net reduction in burden if it reduces decommissioning cost in the long term.

This option potentially has the same legacy site risks as the 1 mSv/yr (100 mrem/yr) option. The LTR requires that licensees take the dose from on-site disposals into account at the time of license termination. A disposal at 0.25 mSv/yr (25 mrem/yr) could potentially take-up a significant portion, or all, of the allowed dose for a site, forcing extensive remediation in other portions of the site, or remediation or the disposal area. Although factors such as decay, dose-modeling assumptions, and the amount of radioactive material actually buried, relative to the amount requested, may mean that the burial actually contributes far less than 0.25 mSv/yr (25 mrem/yr), the potential for increased remediation costs, and thus potential legacy sites, should be considered.

Unlike the 1 mSv/yr (100 mrem/yr) option, NRC may not be able to account for the potential need for remediation of on-site disposals at the time of license termination by requiring additional financial assurance. Increased financial assurance would be difficult to justify for this option because disposals at 0.25 mSv/yr (25 mrem/yr) already meet NRC's unrestricted release criteria of the LTR.

4.3 Continue Current Practice of a "few millirem" for Approving On-Site Disposals

Under this option, staff would continue the current practice of reviewing 10 CFR 20.2002 on-site disposal requests against a dose criterion of a "few millirem."

Pros:
This option furthers NRC's objective of preventing future legacy sites, in that any disposal approved at this level should not require additional remediation or restricted release, because it would only consume a fraction of the 0.25 mSv/yr (25 mrem/yr) dose allowed for the entire site.

As discussed in Section 2 of this Attachment, this option is consistent with the LTR "Statement of Considerations" and the ALARA provisions of 10 CFR Part 20.

Cons:
This option is more restrictive and burdensome on licensees than 1 mSv/yr (100 mrem/yr), which is permissive under 10 CFR 20.2002.

4.4 Only Approve On-Site Disposal for Short Half-Lived Materials

Under this option, NRC would only approve on-site disposals for short half-lived material. Note that this evaluation is generalized in that staff has not developed the exact guidelines for such approvals (e.g., what radionuclides would be included, what dose would be required at the time of disposal).

Pros:
This option would effectively eliminate the concern over on-site disposals becoming future legacy sites.

Cons:
This option is unnecessarily burdensome for licensees as it is more restrictive than staff's current practice, which effectively addresses the concern over legacy sites.

This option is inconsistent with the current 10 CFR 20.2002 regulation and Commission policy (e.g., this option does not reflect a performance-based approach and drastically limits or eliminates the 10 CFR 20.2002 pathway for most NRC licensees). Although depending on the economics, there may be a net reduction in burden if it reduces the cost of decommissioning in the long term.

4.5 Stop Approving On-Site Disposals

Under this option, NRC would no longer allow on-site disposal.

Pros:
This option would effectively eliminate the concern over on-site disposals becoming future legacy sites.

Cons:
This option is unnecessarily burdensome for licensees since it is more restrictive than staff's current practice, which effectively addresses the concern over legacy sites.

This option is inconsistent with the current 10 CFR 20.2002 regulation and Commission policy (e.g., this option does not reflect a performance-based approach and drastically limits or eliminates the 10 CFR 20.2002 pathway for most NRC licensees). This would require a rulemaking to implement.

5. RECOMMENDATIONS

The recommended options and implementation activities to resolve this issue are provided below.

Continue the current practice of approving on-site disposals with 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. This option should be implemented with revised guidance and a Regulatory Issue Summary.

Permit 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 leaving this option available provides licensees with maximum flexibility under the existing regulation. Note that this issue is addressed in Attachment 7 as an indicator of the need for increased financial assurance.

RESULTS OF EVALUATIONS OF THE RELATIONSHIP BETWEEN THE LICENSE TERMINATION RULE AND THE CURRENT CASE-BY-CASE APPROACH FOR CONTROLLING THE DISPOSITION OF SOLID MATERIALS

1. BACKGROUND

Certain stakeholders have questioned the regulatory relationship between the License Termination Rule's (LTR's) dose constraint of 0.25 millisieverts per year (mSv/yr) [25 millirem per year (mrem/yr)] and As Low As is Reasonably Achievable (ALARA) for unrestricted use of a site, and existing guidance for controlling the disposition of solid materials on a case-by-case basis, particularly in instances where residual contamination might be removed from an unrestricted-use site after license termination. This issue was identified in SECY-02-0177, along with planned evaluations that are addressed in this attachment. The first evaluation, section 3.1, explains the differences in types of contamination, potential future uses, and exposure pathways between the LTR unrestricted use provisions and controlling the disposition of solid materials under current guidelines. The second evaluation, section 3.2, discusses factors, such as ALARA and effects of mixing and dilution, that realistically would reduce the dose if residual contamination were removed from an unrestricted-use site after the license is terminated.

2. ISSUE DESCRIPTION AND DESIRED OUTCOME

2.1 Issue: The relationship is unclear between the LTR's dose constraint of 0.25 mSv/yr (25 mrem/yr) and ALARA 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 residual contamination might be removed from an unrestricted-use site after license termination.

2.2 Eventual Desired Outcome: Describe the relationship between the LTR's unrestricted use dose constraint and the existing case-by-case approach for controlling the disposition of solid materials.

3. EVALUATIONS OF RELEVANT INFORMATION

3.1 Differences between the LTR and the Case-by-Case Approach for Controlling the Disposition of Solid Materials

3.1.1 Differences in regulatory purpose and scope

1) LTR

The LTR established radiological criteria for determining the extent to which lands and structures can be considered to be decommissioned, focusing on protection of persons entering and using decommissioned structures and lands at a site after a license is terminated. The technical analyses supporting the LTR made specific assumptions about the types of materials that may be present at a site when a license is terminated, based upon assessment of exposure to an average member of the critical group from those materials present on lands and structures located within the facility boundary, rather than the future use of those materials at *offsite* locations. Residual

radioactivity in solid materials remaining at a site with a terminated license was assumed to be limited to walls, floors, ceilings, and equipment that are part of the building structure, such as metal beams, embedded piping, ventilation ducts, metal doors, wood trim, and plastic fixtures. Also, the LTR assumed that materials and equipment that were readily removable, such as pumps, valves, and tables, would not be present at the time of license termination, because they would have been previously removed from the site. These assumptions were incorporated into the exposure pathways and scenarios that were used in the technical basis to support the dose constraint of 0.25 mSv/yr (25 mrem/yr). Another assumption was that the group of people that comprises the critical group is located within the facility boundary after license termination, per NUREG/CR-5512, "Residual Radioactive Contamination from Decommissioning."

The scope of the LTR purposely did not address clearance of equipment and materials before license termination [see item G.7 of the Federal Register notice for the final rule; 62 FR 39058, dated July21, 1997]. During the development of the LTR, it was recognized that solid materials remaining at a site could be moved to offsite locations after the license is terminated without further evaluation or control. The technical basis for the LTR assumed that offsite release of materials after license termination would be protective of public health and safety and the environment, based on a dose constraint of 0.25 mSv/yr (25 mrem/yr), as well as the conservatism of the selected on-site exposure scenarios that are evaluated for demonstrating compliance with the dose constraint. However, if licensees use more realistic scenarios instead of the default LTR scenarios, potential offsite exposure scenarios may become important for specific sites. Further discussion of LTR scenarios is provided in section 3.A.iv of this attachment, and more detailed information on realistic scenarios is provided in section 3 of Attachment 6 of this SECY paper.

2) Case-by-Case Approach for Controlling the Disposition of Solid Materials

Before license termination, solid materials may be controlled by transfer to a licensed facility, for processing or disposal as low-level radioactive waste. Another available disposition option is to evaluate the material for its radiological characteristics and, if the amount of radioactivity is within certain guidelines, it may be released from the site for unrestricted use to offsite locations, which is referred to as "clearance," or it may be released under restricted conditions, referred to as "authorized use" or "conditional clearance." Before release for unrestricted use or under restricted conditions, solid materials are evaluated for their radiological characteristics for the purpose of protecting public health and safety and the environment at offsite locations. Typically, such releases are made at a small fraction of the established level that provides adequate protection of public health and the environment [1 mSv/yr (100 mrem/yr)].

Unlike the radiological criteria for license termination that were established by the LTR, there are no specific requirements, currently contained in 10 CFR Part 20, for the release of solid materials with small or no amounts of radioactivity. Absent a National standard, the disposition of solid materials before license termination are evaluated on a case-by-case basis and, at this time, are not based on extensive supporting regulatory and technical analyses, such as those developed for the LTR. In accordance with Commission direction, the staff is developing technical information in support of rulemaking in this area, but preliminary information from these ongoing analyses are not incorporated into the current case-by-case approach for controlling the disposition of solid materials (see Agreement State Program Letter No. STP-00-0070, dated August 22, 2000). Thus, the technical basis for the existing case-by-case approach for controlling the disposition of solid materials before license termination is not as well developed as the technical basis supporting

the LTR.

A major difference between solid material releases before and after license termination is that, during operations and decommissioning, materials are evaluated prior to release, but once a license has been terminated and the site is released for unrestricted use, there are no regulatory requirements on the residual radioactivity that may be present at the site, and remaining materials may be used without restriction. Thus, there are no limitations on releases of lands, structures, or other solid materials that remain at a site after a license is terminated for unrestricted use - the concept of clearance or conditional clearance is not applicable because regulatory control over the material terminated with the license. The license termination decision is based on the assessment that the public will be protected under unrestricted use.

A common thread to solid material releases before and after license termination is that, under both circumstances, solid materials can be moved to offsite locations, where members of the public can be exposed to formerly licensed and controlled materials.

3.1.2. Differences in types of materials for release before and after license termination

1) LTR

There are no generally applicable volume, mass, or total radioactivity restrictions on the amount or type of material for the purpose of license termination because the acceptability of a site for license termination is based on compliance with the dose constraint of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group. Thus, the LTR allows flexibility on a site-specific basis concerning the type of materials and amount of residual radioactivity that may remain in lands and structures, and to a certain extent, equipment and materials that are integral to building structures. It is difficult to predict the type and amount of material that may be released from sites with terminated licenses, because of differences in inventory, future planned use of the site, and other site-specific conditions, but the *type* of license does influence the potential for such releases. Currently, the majority of NRC and Agreement State licensees are users of sealed sources, where the radioactive material is encapsulated - such licensee types do not typically release solid materials either before or after the license is terminated. Licensee types that use or possess solid materials that may become contaminated and released offsite include nuclear power plants, fuel cycle facilities, hospitals, research laboratories, manufacturing facilities, and other licensee types that use or possess radioactive material in an unsealed form.

The amounts and characteristics of the residual radioactivity, in materials that are present at a site at the time of license termination, are documented in final status survey reports, which are submitted to demonstrate compliance with the dose constraint. Consistent with the underlying assumptions of the LTR, the scope of these surveys covers 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 released readily from a room, such as desks or processing equipment, would not be present at the time of license termination, and available for future release offsite.

After license termination for unrestricted use, formerly licensed materials at a site become available for release to offsite locations without restriction. This includes residual radioactivity that is associated with buildings or fixed equipment that could be dismantled. The quantity of material and

number of releases that may occur to offsite locations may be small or large and may occur over a short or long period. Sites with terminated licenses may stay undisturbed indefinitely or may be used for other purposes immediately, such as commercial, land-development, or agricultural purposes. Such development can result in materials being moved offsite for a variety of future uses, such as direct reuse, recycling, or disposal in a landfill. Although estimates of the total volume of material or amount of residual radioactivity present at license termination are not required, all sites must meet the same dose constraint, to ensure protection of public health and safety and the environment, thereby limiting excessive amounts of residual radioactivity that could potentially be released offsite, and ensuring protection of public health and safety and the environment.

2) Case-by-Case Approach for Controlling the Disposition of Solid Materials

Before license termination, a variety of solid materials may be released from licensed sites, ranging from small releases of material with little or no radioactivity in or on it, to larger releases. During the operational phase of a licensed facility, releases of solid material with little or no residual radioactivity can occur on a daily basis when commonplace items are moved in and out of the site, such as tools, briefcases, scaffolding, ladders, equipment, ordinary trash, and other items once they are obsolete or no longer useful. Operational releases of solid material can also occur when buildings are renovated or razed, resulting in offsite releases of lumber; roofing materials; metals, such as I-beams, rebar, service and processing equipment; concrete in the form of walls, floors, ceilings, or rubble; soils; and other materials that would be present at a typical industrial site. Larger amounts of these types of materials may be released during the decommissioning phase, as the facility is prepared for license termination.

In general, it is expected that the amount of material remaining at a site that meets the radiological criteria of the LTR is likely greater than the amount of material released offsite under the current case-by-case approach to clearance. However, this generalization depends on the decommissioning approach taken for license termination, which can influence potential releases to offsite locations before or after license termination. Currently, the staff is developing information on the inventory of materials that are candidates for release under the current case-by-case approach, as well as other regulatory alternatives, as part of the technical basis for rulemaking on controlling the disposition of solid materials.

3.1.3 Differences in assessment of potential future uses

1) LTR

As discussed above, although there are no generally applicable volume, mass, or total radioactivity restrictions on the amount or type of material that can be released from a site after license termination for unrestricted use, the residual radioactivity in materials present at a site at the time of license termination is evaluated as part of the license termination process, to ensure compliance with the dose constraint of 0.25 mSv/yr (25 mrem/yr) to an average member of the critical group. The technical basis for the LTR assumed that public health and safety and the environment would be protected if offsite release of materials occurred after license termination, based on this dose constraint. In addition, the two on-site exposure scenarios that are typically used for demonstrating compliance with the dose constraint have been considered sufficiently conservative to be protective of public health and safety and the environment from potential offsite releases after license

termination. However, licensees typically do not evaluate these materials for potential future use at offsite locations, nor does the LTR require such evaluation. Consistent with the technical basis developed for the LTR, if a license is terminated for unrestricted use, there are no requirements for controlling its future use, and the materials residing at the site can be used for any purpose, without restriction, including use at offsite locations.

2) Case-by-Case Approach for Controlling the Disposition of Solid Materials

Similar to offsite releases that may occur after license termination, currently there are no generally applicable volume, mass, or total radioactivity restrictions on the amount or type of material that can be released from a site before license termination. However, a difference between unrestricted releases before and after license termination is that material releases before license termination are evaluated for compliance with existing criteria for controlling the disposition of solid materials, whereas after license termination, there are no requirements for further evaluation. As discussed in the next section, the current case-by-case approach for controlling the disposition of solid materials requires an evaluation of the radiological characteristics of the material before release. Radiological surveys or process knowledge are used to evaluate offsite releases before license termination. Additional evaluations are required for planned releases of solid materials with volumetric contamination before license termination, that include a specific evaluation of potential offsite doses.

Regarding the fate of materials that are released for unrestricted use before license termination, they may end up in the same location or be used for similar purposes as those materials moved from a site after license termination. Materials released before license termination under restricted conditions may also have similar fates as those released without restriction before or after license termination. An example is concrete that is dispositioned from a site and buried in a landfill, to reduce the amount of residual radioactivity before license termination. After the license is terminated, additional concrete from remaining structures or rubble may also be moved offsite for burial at a landfill. Metal is another example of a material that, in the form of processing or service equipment, may be removed from the site during decommissioning, or become available for offsite release when building structures are demolished after the license is terminated. In both circumstances, the fate of the metal may be similar, such as recycling or disposal in a local landfill. Thus, from the perspective of a potential recipient at an offsite location, releases before and after license termination may be similar in their material characteristics
and origin.

3.1.4 Radiological criteria and dose modeling

1) LTR

For solid materials with residual radioactivity that remain at the site after the license is terminated, a dose assessment is performed to ensure compliance with a dose constraint of 0.25 mSv/yr (25 mrem/yr) to the average member of the critical group from all exposure pathways and demonstration that the residual contamination levels are ALARA. This dose constraint is considered protective of public health and safety and the environment, and the appropriate allocation of the public dose limit for license termination, which is assumed to occur once for a U.S. Nuclear Regulatory Commission (NRC)-licensed facility.

The amount of residual radioactivity in lands and structures, that is present at the time of license termination, is evaluated *in toto* and correlated to the dose constraint by evaluating three exposure scenarios for unrestricted release of a site. The technical basis developed for the LTR analyzed exposure pathways for average members of the critical group at decommissioned facilities. The main scenarios considered for future site use were: (a) full-time residence and farming at a decommissioned site; (b) exposure while working in a decommissioned building; and (c) renovation of a newly decommissioned building. These exposure scenarios are considered by the staff to be conservative and therefore tend to overestimate the dose from a site with a terminated license. A result of conservative dose assessment methods can be the reduction in the amount of residual radioactivity remaining at a site with a terminated license, which, in turn, would be available for future release to offsite locations.

For those licensees that do not use default license termination criteria and rely on site-specific modeling, there can be variability in the amount and concentration of residual radioactivity that remains at sites, because of several site-specific factors, including the application of ALARA. Application of this risk-based approach can lead to variability in the amount of residual radioactivity remaining at the time of license termination, but is considered protective of public health and safety and the environment, because a common dose constraint is applied to all sites. Also, for licensees proposing to use more realistic scenarios instead of the generic scenarios in the LTR analysis, the critical group may not exist on-site, but may be future users of recycled materials from the site after the license is terminated, as discussed in Attachment 6 of this paper. It is noted that the LTR requires the dose to an average member of the critical group be less than 0.25 mSv/yr (25 mrem/yr), but does not specify whether the average member of the critical group must be located on-site or offsite. Consistent with the technical underpinnings of the LTR, current staff guidance for implementing the LTR does not incorporate a specific recommendation to analyze potential impacts from offsite releases of residual radioactivity at a site with a terminated license.

2) Case-by-Case Approach for Controlling the Disposition of Solid Materials

Before the establishment of the LTR, radiological criteria for license termination and for controlling the disposition of solid materials were similar for many cases, and some sites grandfathered under the Site Decommissioning Management Plan (SDMP) Action Plan continue to apply these criteria. Two examples are Regulatory Guide 1.86, entitled “Termination of Operating Licenses for Nuclear Reactors,” and Fuel Cycle Policy and Guidance Directive FC 83-23, entitled “Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Byproduct, Source or Special Nuclear Materials Licenses.” The table of surface contamination criteria contained in these documents has been used by licensees for demonstrating that solid material with surface contamination can be safely released with no further regulatory control. The criteria do not include an upper limit on the amount of solid material with surficial contamination that can be released for unrestricted use.

Radiological criteria for surface contamination on materials were based principally on the capabilities of readily available instrumentation at the time the guidance was developed and therefore are not dose- or risk-based, or developed through exposure pathway and dose modeling. According to information contained in Inspection and Enforcement Circular No. 81-07, “Control of Radioactively Contaminated Material,” doses from releases of material and equipment with surface contamination are less than 0.05 mSv/yr (5 mrem/yr). Currently, a comprehensive exposure pathway and dose modeling methodology is under development by the staff that, when completed,

could be used to provide an updated estimate of hypothetical doses associated with the current case-by-case approach for controlling the disposition of solid materials.

As discussed above, 10 CFR Part 20 does not currently contain specific requirements for the release of solid materials with small or no amounts of radioactivity. At materials sites, solid material releases with surface contamination is generally authorized on a case-by-case basis by incorporating existing regulatory guidance or other case-specific criteria into specific license conditions. At reactor sites, solid material is controlled by using the existing "no-detectable" policy outlined in HPPO-71 of the "Health Physics Position Data Base," NUREG/CR-5569, as improved by current industry practice. In summary, if a reactor licensee conducts appropriate surveys and does not detect licensable material above natural background levels, the solid material in question does not have to be treated as waste. Thus, when solid material with surficial radioactivity is released before license termination, both reactor and materials licensees must first survey it and disposition the material in accordance with applicable conditions. Although this approach adequately protects public health, safety and the environment at a fraction of the established level of 1 mSv/yr (100 mrem/yr), the lack of established radiological criteria for controlling the disposition of solid materials could result in inconsistent release levels because not all licensees use the same criteria, survey instruments, or procedures to monitor solid material releases.

For solid materials that contain slight levels of volumetric contamination, industry practice over the years has been to request approval on a case-by-case basis to release materials to offsite locations before license termination. Such requests have included comparatively large volumes of material, which have been reviewed as requests for alternate disposal procedures, under 10 CFR 20.2002. Both reactor and materials licensees have used this process to seek approval for the unrestricted release of material, which typically involve the burial of solid materials on the licensee's site, or disposal at a nearby landfill. Licensees are required to identify and describe the waste, the disposal site, pathways of exposure, and calculate doses to members of the public and workers, that are specific to the request. Proposed offsite releases of solid material with volumetric sources of contamination are evaluated by applying the guideline that maximum annual doses should not exceed a small fraction of the annual public dose limit of 1 mSv/yr (100 mrem/yr). For most cases, requests are approved on a case-by-case basis under a criterion of a "few mrem/yr," rather than use of LTR or SDMP Action Plan criteria.

Although there are similarities in the exposure scenarios used in dose-modeling studies for clearance and the LTR, such as building occupancy and land use, there is a fundamental difference between the two approaches. The technical basis for the LTR assumes that an individual may be exposed by residual radioactivity which resides at a single fixed location under three conservative and probable scenarios. Regarding the current case-by-case approach for controlling the disposition of solid materials, an individual may come into contact with previously regulated materials in dozens of scenarios at offsite locations, such as use of consumer products, handling of released materials by workers in other industries, and residence near a local landfill, etc. Consequently, the concentration of residual radioactivity in materials that are candidates for release under the LTR and clearance may differ, because of differences in the two sets of dose-modeling assumptions and the application of different risk goals.

After the license is terminated, technical differences between the analyses become less important because materials that are released offsite after license termination can have fates similar to

materials released to offsite locations before license termination. Exposure scenarios and dose modeling for clearance could be applicable conceptually to offsite releases after license termination. Understandably, assumptions used in the dose modeling for clearance would need to be reviewed for applicability to offsite releases after license termination, such as the amount and duration of releases, and the extent of mixing with non-impacted materials in offsite locations, etc. For example, releases made before license termination are surveyed to ensure compliance with applicable clearance criteria, but absent such controls after license termination, a greater inventory of materials could be released in a shorter period of time than would be possible if the material had been released before license termination.

In general, projected dose estimates from the current case-by-case approach for controlling the disposition of solid materials before license termination appear to be consistent with the LTR dose constraint, based on the fractional allocations of the public dose limit or risk from radioactivity released to the public. A difference between these allocations is that the lower dose limit associated with the current case-by-case approach for controlling the disposition of solid materials accounts for multiple releases of materials and equipment that may occur over the operating and decommissioning phases of a license, whereas 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. The existing risk-informed/performance-based graded approach to managing the release of materials under the LTR and the current case-by-case approach for controlling the disposition of solid materials addresses the need for adequate protection without undue burden on operator and regulatory resources.

3.2. 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

3.2.1 Dose reduction by ALARA and mixing

1) LTR

As discussed above, the LTR dose constraint is based on an all-pathways dose limit of 0.25 mSv/yr (25 mrem/yr) to an individual occupying the site after license termination plus ALARA. As part of the license termination process, ALARA analyses are conducted on a site-specific basis to reduce the dose from residual radioactivity. Staff experience with license termination plans indicates that this requirement effectively reduces that amount of residual radioactivity remaining at the time of license termination.

The technical basis for the LTR recognized that individuals residing or working at a decommissioned site would actually receive doses substantially below the constraint level because of ALARA considerations, dose-modeling assumptions, and other factors inherent to the decommissioning process itself. Staff experience with decommissioning casework, involving a variety of facility types over many years, indicates that certain decommissioning practices reduce the residual radioactivity to levels much lower than the dose constraint at the time of license termination. For example, cleanup of concrete by scabbling frequently removes a layer of concrete that contains a large fraction of the residual radioactivity. The final report of the “Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities,” NUREG-1496, assumed that removal of a layer of concrete by scabbling will result in doses at levels from 2 to more than 10 times lower than a

constraint value. For many decommissioning sites, this is similar for soil removal, which oftentimes involves over-excavation. Another decommissioning practice at some sites is reliance on residual radioactivity levels well below the dose constraint to increase statistical confidence in final status surveys for compliance purposes, thereby simplifying the survey process and reducing costs. These factors, combined with inherent conservatism in dose modeling, can reduce residual radioactivity at a site with a terminated license to levels that are a fraction of the LTR dose constraint.

Another consideration is that movement of material containing residual radioactivity after license termination will likely include commingling with other material that has very little or no residual radioactivity from licensed operations. For example, if dirt or concrete is moved to an offsite or other on-site location, the concentration of residual radioactivity will likely be significantly diluted in the resulting mixture of materials. Also, if materials remaining at sites with terminated licenses are disposed of in local landfills, there would be mixing with large amounts of other materials, which would further dilute the concentration of residual radioactivity.

This combination of on-site and offsite factors likely reduces the concentration of residual radioactivity to levels that correspond to a fraction of the LTR dose constraint, should materials be moved from a site after the license is terminated.

2) Case-by-Case Approach for Controlling the Disposition of Solid Materials

ALARA evaluations have also been performed in the existing case-by-case approach for controlling the disposition of solid materials. For example, ALARA is considered when evaluating authorized releases under restricted conditions in accordance with 10 CFR 20.2002. Similar to the LTR discussion above, the same factors can apply to clearance, such as survey approaches, and offsite and onsite mixing and dilution.

4. RECOMMENDATIONS

The staff recommends describing the relationship between the LTR's unrestricted-release dose constraint and the existing case-by-case approach for controlling the disposition of solid materials. The staff's qualitative judgment, at this time, is that the LTR is protective of public health if materials are removed from a site after license termination for unrestricted use, mainly due to the conservatism in the LTR technical basis and current dose-modeling assumptions, ALARA considerations, and the effects of mixing when residual radioactivity is moved to other locations. This should be clarified in a Regulatory Issue Summary.

Note that insights from the ongoing technical development associated with the rulemaking effort on controlling the disposition of solid materials can be used in the development of a rationale to further explain the relationship between criteria in the LTR and those for controlling the disposition of solid materials, and support the current view that the LTR is protective of offsite releases after license termination for unrestricted use.

RESULTS OF EVALUATIONS FOR
REALISTIC EXPOSURE SCENARIOS

1. BACKGROUND

Issue 2.0 in SECY-02-0177 was a staff-initiated review of overall use of scenarios for both restricted and unrestricted release and the need for policy guidance regarding conservative or more realistic scenario identification and justification by the licensee. Experience with licensees' decommissioning plans and license termination plans under the license termination rule (LTR) has raised questions and concerns, by both the staff and licensees, about the potentially unnecessary conservatism that has been inherent in most dose assessments.

The staff has, and will continue to, advance projects that will strengthen and improve the technical aspects of dose modeling through both guidance development and research. This includes: (1) improving the models, (2) widening the suite of computer codes available, (3) improving our understanding of the uncertainties and variabilities in the important parameters, and (4) providing flexible guidance so that licensees can model their sites appropriately in a cautious but reasonable approach without requiring the analyses to be overly conservative. The present guidance development has increased the acknowledgment of the flexibility inherent for the licensee in model and parameter selection. However, the main policy-related concern is what justification is required to choose land uses for analysis, especially if the assessment period is 1,000 years. As has been noted by the National Research Council's National Academy of Sciences, in their 1995 "Technical Basis for Yucca Mountain Standards," and others, forecasting human behavior (and, by extension, land use) over more than a few decades is impossible and would have no technical basis.

In this review, a distinction will be raised between two specific types of scenarios: (1) land-use scenarios, and (2) exposure scenarios. Land-use scenarios are defined as the more general scenario of the future use of the land, without specifying a specific exposure group. Exposure scenarios are the combination of a specific land-use scenario and a specific exposure group. Thus, knowledge of the expected land use may not be sufficient in itself to determine the specific group to be analyzed as different exposure groups may be developed from a given land-use scenario. For example, the future land use at a site may be justified as industrial and this would be the land-use scenario. There are a variety of exposure scenarios for industrial land use including, but not limited to: (1) workers involved in construction on the site; (2) maintenance crews; (3) long-term workers of the site, using current buildings and structures; and (4) long-term workers in areas constructed post-license termination. Having justified the land-use scenario, the licensee must justify which exposure scenario involves the critical group at the site. The critical group will depend on the radionuclides (and their concentrations) and the available exposure pathways at the site.

Not all exposure scenarios need to be explicitly developed and may be eliminated as not impacting the critical group, in a number of instances, by qualitative arguments. For example, if the radionuclides present in an industrial land-use scenario are primarily an external hazard (e.g., cobalt-60 or thorium), the most important factor is time on the site. Therefore, the critical scenario is more likely to be a long-term-worker exposure scenario. The licensee could likely

justify not quantifying the maintenance or construction workers, because these scenarios generally involve less exposure time and would result in less dose than the long-term worker.

It is a common perception that the LTR results in requiring licensees to base remediation and site release criteria on the generally very conservative residential-farmer exposure scenario, especially for unrestricted release or, for restricted release, where the institutional controls are assumed to fail. In the residential-farmer exposure scenario, the critical group is assumed to be future occupants, of the site, that have a house and produce a substantial fraction of their own food, including vegetables, fruits, grain, meat, milk, and possibly even fish. However, the LTR would allow the licensee to justify alternate scenarios more appropriate to the site. There may be a number of reasons why licensees choose to use the residential-farmer scenario rather than justifying an alternative scenario. These reasons include the need, under current guidance, to justify the scenario for the next 1,000 years, lack of extensive alternative scenario development, and, potentially, licensee desire to avoid being a 'test case' for the NRC staff's review, likely resulting in a longer licensing review.

2. ISSUE DESCRIPTION AND DESIRED OUTCOME

Issue: Clear direction and guidance are needed for selecting realistic exposure scenarios, for both unrestricted release and restricted release, that appropriately considers institutional control effectiveness and radiological risk.

Eventual Desired Outcome: Implement dose assessment exposure scenarios and modeling assumptions that are risk-informed, realistic, and reflect a logical extension of existing site-specific conditions for the foreseeable future. Specifically, identify what justifications are adequate to use scenarios other than the generic screening scenario of a resident farmer, in light of the 1,000-year dose-modeling time period.

3. EVALUATIONS

3.1 Present Approach and Guidance

In the LTR, the consideration of the scenario comes as part of the definition of critical group. The 10 CFR 20.1003 definition of critical group is "... the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances." The "applicable set of circumstances" is generally called the scenario. In the Statement of Considerations (SOC) for the final rule, it is noted that "...such analyses should consider exposure ... using cautious but reasonable assumptions." (62 ***FR*** 39068) The rule, also, specifies, in 10 CFR 20.1401(d), that calculations should determine the peak annual dose expected, within the first 1,000 years, after license termination.

The staff's current approach and guidance are discussed in the Nuclear Material Safety and Safeguards (NMSS) Consolidated Guidance for Decommissioning (draft NUREG-1757, Volume 2). This guidance was developed with substantial public involvement through the use of public meetings on draft portions of the original guidance document, the NMSS Decommissioning Standard Review Plan (NUREG-1727, September 2000). This specific guidance development was part of a larger effort to help licensees use the LTR. To assist the vast majority of licensees, guidance development focused on the use of screening analyses and

simple site-specific methods. NRC developed a computer code, the DandD computer code, to perform screening analyses and simple site-specific calculations, and published, in the Federal Register, tables of screening values for licensee use. All these screening analyses and simple methods used the conservative residential-farmer exposure scenario as, or the basis for, its compliance scenario. By using this approach, the licensee was largely freed from having to justify what potential scenarios could occur over the next 1,000 years. Guidance was developed to assist licensees in removing pathways of exposure because of physical limitations at the site (Appendix M, draft NUREG-1757, Volume 2). NUREG-1727's Appendix C (Appendix I of draft NUREG-1757, Volume 2) did have a section on developing site-specific scenarios. However, it appears that the overall tone that readers received was that alternate scenarios would require analyzing anything that could potentially occur at the site over the next 1,000 years.

In summary, guidance has tended to result in licensees reverting to the use of a residential farmer exposure scenario. In part, the guidance is based on the concept that if the dose analysis is needed for a 1,000 year period, the scenario modeled should have an expectation of lasting a 1,000 years. However, as has been noted by the National Research Council's National Academy of Sciences and others, forecasting human behavior (and, by extension, land use) over more than a few decades is impossible and would have no technical basis. Therefore, the current guidance suggests that alternate scenarios are generally limited to either sites with relatively short-lived residual radioactivity (less than or equal to 30 years); sites with physical constraints on use (e.g., non-potable groundwater); or consideration of institutional controls. Although the guidance does not preclude the use of alternate scenarios in other situations, the licensee is responsible, and must take the initiative and the related additional costs, for providing the justifications and specific scenarios.

For restricted release scenarios, the licensee is guided to calculate scenarios both where all the restrictions completely fail and where partial failure of restrictions may be important. However, the guidance does not discuss weighting the risk of the scenario, when determining the needs for the durability and length of institutional controls. The reader is left with the impression that all failure and partial-failure scenarios are treated equally. In addition, the use of scenarios, consistent with current guidance, in evaluating the need for institutional controls, or the effects of failure, may result in unnecessary regulatory burden. The conservative dose estimates may result in sites pursuing restricted release in cases where unrestricted release may have been possible, or requiring the licensee to adopt restrictions that are more durable or comprehensive than necessary.

Only a few licensees have attempted to develop alternate scenarios for unrestricted release. The staff has taken the position that unrestricted land-use scenarios are normally based solely on physical characteristics such as natural impediments of the land that may constrain the future use of the site. In one case, where the site is also involved in complying with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the staff relied on consensus determinations from a variety of stakeholders to develop the land-use scenario. The staff has not yet supported justifications based primarily on restrictions flowing from State and Federal regulations for unrestricted release, as these regulations have been considered institutional controls, which, by the LTR, requires an analysis assuming that these restrictions fail. There are a number of factors that may account for the low number of licensees taking advantage of that flexibility. These include: (1) scenarios are licensee-initiated and -justified; (2) not all NRC staff understand the guidance's flexibility; and (3) lack of

comprehensive staff guidance including the lack of well-developed examples of alternate scenarios. Each is discussed below.

1) Licensee-Initiated or -Justified Scenarios

Our current approach relies on licensees' submittals and their justification of the chosen scenario(s). The decision on which scenario to use depends on a number of factors, with guidance being just one. Although current guidance does allow a large amount of flexibility, the licensee needs to have the expertise and information to justify its approach. Therefore, most licensees use the most expedient method and just choose to use default approaches. Another reason licensees tend to use the generic scenarios is that, generally, they are reluctant to become a test or special case, as these tend to make NRC reviews take longer. This results in greater expense, either, directly from NRC fees, and licensee staff and contractor time in supporting the decommissioning plan or LTP, or indirectly, through time delays in decommissioning or having such proposals rejected. Since not many licensees are pursuing the alternate scenarios, the staff is not approving many such requests, which the licensees may perceive as staff reluctance to approve more realistic scenarios.

2) Staff's Lack of "Corporate" Knowledge of Successes

Staff understanding of the details of dose modeling is growing with every case that is reviewed. Although some staff have worked on cases where more realistic scenarios have been involved, no "library," database, or wide corporate knowledge of these cases exist. Usually the only staff aware of the flexibilities inherent in the staff guidance are the dose modeling specialists and the few project managers with sites that have already performed site-specific modeling. Licensee interactions with staff that have not been previously involved in one of the cases using alternate modeling may reinforce the licensee's perception of staff reluctance. Although draft NUREG-1757 Volume 2 has tried to improve this with added emphasis on the flexibility in the staff guidance, information on actual site approvals (and rejections) of proposed alternate scenarios could lead to improved use of realistic scenarios. This information will also help remind the staff that management will support it in approving site-specific alternate scenarios.

3) Lack of Well-Developed Examples of Alternate Scenarios

One daunting task facing licensees that choose to develop alternate scenarios is deciding which scenarios to analyze. After tackling the issue of possible land use at the site, the licensee may need to analyze a number of exposure groups to find which is the critical group. In addition, as the number of pathways decreases, the importance of re-use exposure scenarios will rise. In these cases, the greatest exposure will be for the media containing residual radioactivity to be removed from the site and used in an alternate way. For example, if a gravel pit contained residual radioactivity that did not pose an external hazard, the on-site realistic doses would be very small per unit of radioactivity. However, the use of the gravel containing residual radioactivity offsite as an underlying drainage layer for a garden could result in higher doses because of the food ingestion pathway. Guidance or good sets of examples are limited in this area as most have focused only on the conservative use of the residential farmer exposure scenario.

The development of NUREG-1640, which analyses generic dose assessments for various re-use scenarios, will help the staff understand the importance of re-use analyses but, for on-site analyses, there is limited information (such as Appendix M of draft NUREG-1757, Volume 2), especially if the land-use scenario is not residential.

3.2 Case Studies

The following two cases describe sites that have chosen to pursue more realistic scenarios that the staff has approved. There are a number of other sites that could use the approach for more realistic scenarios or risk-informing the use of institutional controls.

1) Nuclear Fuel Services, Inc.

Nuclear Fuels Services, Inc., a fuel fabrication licensee in Erwin, Tennessee, provided a decommissioning plan for part of its operating site. As part of the proposed decommissioning plan, the licensee asked to use a set of alternate exposure scenarios whereby the groundwater was not a dose pathway and the critical group did not perform animal husbandry. The reasoning for eliminating the ground-water pathway was, in part, its connection with the surface water and, therefore, the likelihood of potential bacterial and other contamination keeping a reasonable individual from using it for drinking or gardening. The licensee argued that the site is being encroached on by suburban residential use and use by a farmer would not be reasonable. The licensee considered four exposure scenarios: 1) suburban resident, 2) industrial worker, 3) recreational user, and 4) construction worker. The site's decommissioning concentration guideline levels (DCGLs) were based on the most limiting scenario on a radionuclide-specific basis. Part of this approval involved efforts of consensus-building between the State of Tennessee, the U.S. Environmental Protection Agency (EPA), and the U.S. Nuclear Regulatory Commission (NRC), on appropriate scenarios, including the assumption that ground-water use was not a reasonable assumption. The licensee did include dose assessments for the resident farmer and ground-water use for comparison purposes.

2) Watertown - U.S. General Services Administration (GSA)

The U.S. Army Corps of Engineers (USACE) performed a consensus-building process to identify the appropriate scenarios to analyze under CERCLA for the Watertown-GSA site, and requested that they be used to show compliance with the LTR. This is a site next to the river in the city of Watertown, Massachusetts, that was used as a burn pit for waste from another previously-licensed site, which was remediated to meet the Site Decommissioning Management Plan criteria. The Watertown-GSA site is Federally owned and will revert to State ownership at the end of remediation. The burn pit and surrounding area contain a mixture of uranium and chemicals. Members of the board looking at the scenarios and analysis included the State of Massachusetts environmental agency, State of Massachusetts radiological agency, representatives from local and State planning boards, representation of the State's public parks commission, and local representatives of the community. The long-term plan for the use of the land is a riverside State park. USACE requested, and received, NRC approval for DCGLs for uranium based on scenarios, approved by consensus on the reasonably anticipated land use, associated with public parks. USACE explored four exposure scenarios related to

the public park land-use scenario: (1) construction worker, (2) maintenance worker, (3) child recreational user, and (4) adult recreational user. The compliance analysis for NRC and the State of Massachusetts radiological limits used the construction worker, because of the annual dose limit requirement. The State of Massachusetts used the maintenance worker for the chemical and combined risk analysis because of its focus on lifetime risks.

3.3 EPA Approaches

The staff focused on the guidance EPA had developed for the CERCLA regulations, since the U.S. Department of Energy and American Society for Testing Materials approaches are based on the CERCLA guidance. As noted in the EPA guidance for determining land use (OSWER Directive No. 9355.7-04, May 25, 1995), EPA has also been criticized, like NRC, for too often assuming residential land use. EPA, therefore, modified its approach to use the reasonably anticipated land use. Under this approach, a committee of EPA and other stakeholders, such as local land-use planning authorities, local officials, and the public, develop likely scenarios, taking into consideration land planning, past history and trends. The general time frame of interest is the next few decades. The guidance suggests that the risk from other land uses be evaluated, especially where there is some uncertainty regarding the anticipated future land use. Most sites will have deed restrictions or other devices applied, to increase the likelihood of the reasonably anticipated land use.

An important distinction between NRC's LTR and EPA's CERCLA is one of finality. EPA does not release sites for unrestricted use as NRC does since EPA's CERCLA does not provide for finality. Recently, EPA issued "Final Guidance on Completion of Corrective Action Activities at RCRA Facilities", 68 FR 8757 (February 25, 2003). This document introduced "unrestricted use" to mean generally a cleanup of soil to residential standards and groundwater to drinking water standards. EPA noted that notwithstanding releasing sites, EPA could take action under its imminent and substantial endangerment provisions of RCRA. The staff intends to discuss this recent guidance with EPA. Under CERCLA, EPA requires its sites to undergo a 5-year review of the remedy and, if conditions (such as land use) change, more remediation may be required. This provides assurance that future exposures will largely be limited to the land uses that are considered as part of the remedy analysis. It should also be noted that exposure calculations for EPA's remedies are only done for approximately the next 30 years post-remedy. NRC's approach has been to calculate exposures over the next 1,000-year-analysis time period, to consider such processes as leaching and radioactive ingrowth and decay.

EPA's consensus process to develop scenarios with its 5-year-review periods is more risk-informed in evaluating the potential risks from a number of uses and focusing on the more realistic use of the land than NRC's current approach. On the other hand, NRC's current approach to scenarios is sufficiently conservative, such that, it does not need to rely on periodic site monitoring. Because EPA's approach inherently assumes the 5-year-review periods, the EPA approach is not applicable to most NRC licensed sites released for unrestricted use, because they will not need periodic site monitoring. It may be useful to sites, such as, the Watertown - GSA site, which are undergoing a CERCLA process, and the CERCLA process could be factored into our implementation guidance, by allowing licensees to use the results of the process as justification for the appropriate scenarios.

4. EVALUATION OF OPTIONS

In considering options for the approach for selecting scenarios to model, it is important to note, as stated in section B.3.2 of the SOC for the LTR, that unrestricted release "requires no additional precautions or limitations on use of the site after licensing control ceases, in particular for those sites with long-lived nuclides." 62 ***FR*** 39069 (July 21, 1997). As noted above, since the rule requires an analysis of the dose over a 1,000-year period, it is reasonable to read the regulations as requiring that the scenario that is modeled be preserved over the time period for the analysis period, i.e., 1,000 years, for long-lived radionuclides. Thus, in determining the scenario, there should be sufficient robustness in the scenario assumptions such that controls are not needed to meet the dose constraints over that time. This raises the fundamental question as to the degree of certainty or expectation that the model analyzed will last for the 1,000 year period.

As noted earlier, the National Academy in its review of Yucca Mountain noted it is not possible to predict future societal uses of land on the basis of scientific analysis . This has lead some to default to a residential-farmer (or more conservatively, a subsistence-farmer) scenario, as that scenario generally creates the highest exposures and, therefore, it is a conservative approach to addressing the uncertainty for the future. However, neither the rule nor SOC directly addresses this issue and, to the contrary, the SOC can be read as not compelling a licensee to default to the residential-farmer scenario. It is also contrary to the position the Commission took in developing 10 CFR Part 63, where the Commission requires the scenario to be based on current land conditions and use.[1]

In the discussion of restricted use in section B.3.3 of the SOC for the LTR, the Commission recognized that absolute assurance was not needed for the scenario. Specifically the Commission stated:

> Requiring absolute proof that such controls would endure over long periods of time would be difficult, and the Commission does not intend to require this of licensees. Rather, institutional controls should be established by the licensee with the objective of lasting 1000 years to be consistent with the time-frame used for calculations (and discussed in Section IV.F.7). Having done this, the licensee would be expected to demonstrate that the institutional controls could reasonably be expected to be effective into the foreseeable future.
>
> To provide added assurance that the public will be protected, the final rule incorporates provisions (§20.1405(c)) for financial assurance to ensure that the controls remain in

[1] It is noted that at Yucca Mountain, 10 CFR Part 63 does not call for the most conservative scenario that could occur in the future, i.e., subsistence farmer. Rather, Part 63 uses a scenario based on current conditions and uses of the land. The Commission noted in section 3.6 of the SOC, for that rule, that present evidence indicated that there are no subsistence farmers in the vicinity of Yucca Mountain. Most importantly, the Commission stated that it "disagrees with the suggestion that the excessive conservatism of the subsistence approach is needed to offset any presumed lack of conservatism from the assumption of current conditions." 66 ***FR*** 55732 (November 11, 2001).

> place and are effective over the period needed. With these provisions, the Commission believes that the use of reliable institutional controls is appropriate and that these controls will provide a high level of assurance that doses will not exceed the dose criterion for unrestricted use. (Emphasis added) 62 ***FR*** 39070 (June 21, 1997).

It is clear by this language that the Commission expected that the restricted release scenario be developed with the objective for lasting a 1,000 years. At the same time, the Commission introduced the concepts of expectation and reasonable foreseeability. These concepts are consistent with the approach taken at Yucca Mountain. Consequently, this section considers two options: the current approach, and an approach that is based on what is reasonably foreseeable. The latter approach attempts to predict the future site uses based on 1) the nature of the land and reasonable predictions based on its physical and geologic characteristics; and 2) societal uses of the land based on past historical information, current uses, and what is reasonable foreseeable in the future. Given the difficulty of predicting future uses of land, the scenarios would be based on foreseeable uses within the next few decades and possibly 100 years. Similar to Part 63, this approach assumes a logical extension of today's existing society. The staff believes it is unreasonable to assume extreme changes in the culture of our society, revolutions, wars or other disruptions that could affect scenarios over a 1,000 year period.

4.1 No Change in Current Approach

One option is to continue with the current guidance and approach of analyzing any viable scenario over the next 1,000 years. Under this approach, additional guidance development would be minimal. More emphasis could be placed on explaining, and illustrating, examples of the current flexibility in the guidance and LTR. This option has the following pros and cons.

Pros:

1) This approach requires minimal resource requirements, as it mostly would rely on current guidance with minor improvements;
2) Finality of decisions would be more assured, as sites would be likely to use conservative scenario development;
3) Because of this conservatism, there would be more certainty that exposures would be less than the limit, and the need to exercise actions under 10 CFR20.1401(c) would not be likely;
4) This approach would be consistent with past licensing actions; and
5) The public confidence would likely be higher as the conservatisms would require more remediation at sites.

Cons:

1) Most sites would continue to use the residential farmer default scenario, thereby, analyses would remain very conservative;
2) This would maintain the large burden on licensees to provide justifications for scenarios other than residential farmer, or to perform more extensive and costly remediation;

3) This approach is largely inconsistent with the actions of other Federal agencies, which are using the reasonably anticipated land use;
4) Compliance is generally driven by an arguably low probability scenario and is not very risk-informed; and
5) It is not consistent with the approach taken in 10 CFR Part 63.

4.2 Allow Justification of Scenarios Based on Reasonably Foreseeable Future

Under this option, for unrestricted release, the guidance for the definition of "applicable set of circumstances" of the LTR would be issued. Instead of the current approach, where, for most analyses, scenarios are based on any viable land uses over the next 1,000 years, this approach would focus land-use scenarios on (1) the nature of the land and reasonable predictions based on its physical and geologic characteristicness and (2) societal uses of the land based on past historical information, current uses , and what is reasonable foreseeable in the future. Analyses would still be performed for 1,000 years. Primary justification for scenarios would still be related to physical features of the site, radionuclide half-life, and the time of peak exposure. However, the reasonably foreseeable future could be based on advice from land planners and other stakeholders on what possible land uses are likely within a time period of the next few decades to around a hundred years. Alternate scenarios to the reasonably foreseeable would be analyzed to understand the robustness of the analysis, similar to suggestions by the International Commission on Radiological Protection (ICRP) in ICRP Publication 82, Protection of the Public in Situations of Prolonged Radiation Exposure. Compliance would still be based on the reasonably foreseeable scenarios but these less likely alternate scenarios would provide the staff with the information to reach a risk-informed decision.

For restricted release analyses, a similar approach would be taken. The range of analyses could assist in deciding which institutional controls would be necessary. The alternate failure scenarios could be used to provide information on how durable these institutional controls need to be. The pros and cons for this approach are:

Pros:

1) Scenario selection is more practicable and, potentially, more understandable to stakeholders;
2) This approach would offer a greater opportunity for an economically feasible, yet safe, remediation at more sites; facilitating the return of the sites to productive use and reducing unnecessary remediation;
3) Some of the sites that would need to be restricted under the current approach could possibly achieve unrestricted release using more realistic scenarios;
4) This approach would be more consistent with the scenario approaches for both low-level and high-level radioactive waste;
5) More realistic scenarios would allow the staff and licensee to focus on the important institutional controls and the level of durability needed for each of them;
6) Speculation on future land use is bounded; and
7) This approach, based on more realistic scenarios, is more risk-informed than the current approach.

Cons:

1) There are important differences between CERCLA and NRC's LTR, specifically, the lack of the 5-year review for NRC's unrestricted-release option. This could result in a decision not being as certain, since one of the unlikely land-use scenarios could occur at a site and result in a dose that exceeds the dose limit;
2) Seeking consensus between stakeholders in some cases may be difficult to obtain, in which case this approach may be resource intensive because of the effort needed to defend the scenario;
3) Both the licensee and NRC will need to invest additional resources to develop and review scenarios for sites looking for unrestricted release;
4) The public may interpret the policy change as a reduction in protection. This could result in a reduction of public confidence; and
5) Based on 10 CFR 20.1401(c) there could be a need to require additional remediation if the actual land use is different than the predicted land use.

5. RECOMMENDATION

The staff recommends that the guidance be clarified to note that more realistic exposure scenarios can be justified by licensees assuming reasonable foreseeable (e.g., a few decades and possibly up to 100 years) land use for the 1,000 year analysis time period for both unrestricted and restricted release analyses. This option would be implemented in revised guidance and a RIS.

Note that the staff will provide to the Commission cases that may implement this approach in the near future, e.g., the AAR, Cabot-Reading, Michigan Department of Natural Resources, and Fansteel sites. In addition, if the Commission approves the recommended option, the staff will seek to implement the option in advance of the RIS and guidance, if it will further the decommissioning process.

The staff continues to be committed to improving the other technical areas of dose modeling for decommissioning. These include improving the guidance, pursuing computer model improvements and development, and improving the state of knowledge on individual parameters and processes involved.

RESULTS OF EVALUATIONS FOR
MEASURES TO PREVENT FUTURE LEGACY SITES BY
CHANGES IN FINANCIAL ASSURANCE

1. BACKGROUND

A number of sites licensed before financial assurance regulations were issued in 1988 now find that the full cost of decommissioning exceeds their projections. The staff evaluated approaches to obtaining the maximum possible financial assurance for funding from the licensees for decommissioning these legacy sites. In addition, experience in applying the regulations provided the staff with a number of lessons learned that can be applied in the future. The results of the staff's evaluations and its recommendations for improvement are presented.

2. ISSUE DESCRIPTION AND DESIRED OUTCOME

2.1 Financial Assurance/Bankruptcy

2.2.1 Issue: Staff experience identified the following financial risks that may cause shortfalls in decommissioning funding:

1) Restricted release assumption causes underestimation of decommissioning costs;
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 balance; and
7) Accidental release increases decommissioning cost.

2.2.2 Desired outcome: Avoid future legacy sites and increase the probability that existing and future sites will have adequate funding for decommissioning costs.

3. EVALUATION OF FINANCIAL RISKS

3.1 Restricted Release Assumption Causes Underestimation of Decommissioning Costs

Staff experience indicates that complex sites underestimate their decommissioning costs by a factor of 2 to 5. Recent independent cost estimates performed by a U.S. Nuclear Regulatory Commission (NRC) contractor for the Safety Light and Fansteel sites support that experience.

In some cases, such as Fansteel, the licensee originally produced an estimate for a restricted release scenario using on-site disposal of contaminated soils, which resulted in a relatively low estimated cost. However, Fansteel found it was unable to meet the criteria for restricted release with onsite disposal. Fansteel's accounting auditors required it to increase its decommissioning cost estimate from $4.5 million to $57 million, to provide for offsite disposal of contaminated soils. The timing of recognizing the increased environmental liability coincided with a large capital write off and a downturn in business activity. The combined adverse financial events resulted in Fansteel entering bankruptcy.

Initial underestimation of decommissioning costs can occur despite compliance with the regulations. Current regulations require a licensee to report its estimated cost of

decommissioning in a Decommissioning Funding Plan (DFP) when it applies for a license. (Licensees existing as of 1988 were required to submit a DFP by 1990, with certain extensions for licensees in timely renewal.) However, the current regulation does not require the licensee to obtain NRC approval of its cost estimate. In addition, the current regulation does not specify the basis the licensee must use for the cost estimate. Consequently, the staff must accept the basis submitted by the licensee if it appears reasonable. In some cases, licensees have assumed the lower-cost restricted release without a demonstration that the licensee can actually meet the required criteria.

The DFP must provide a means to adjust the cost estimate and funding level periodically, pursuant to 10 CFR 30.35(e), 40.36(d), and 70.25(e). The regulations do not specify what adjustment is required, nor what period may elapse between adjustments. However, the regulations governing the Decommissioning Plan (DP) (10 CFR 30.36(g), 40.42(g), and 70.38(g)) require that, at the time of submittal of the DP, the licensee must update its cost estimate and provide financial assurance to cover the cost. In some cases, a requirement to update the decommissioning cost estimate is placed in a license condition.

This situation results in the potential for a licensee to initially provide inadequate financial assurance, primarily because of reliance on a cost estimate for restricted release. Even where a license condition requires frequent updates, the initial assumption of restricted release permits a level of financial assurance that may eventually prove to be inadequate. The situation can remain unchanged for many years, until license termination, when it may be too late for the licensee to meet its financial obligations for cleanup.

In the staff's view, a licensee should design and operate its facility to avoid the spread of contamination that would result in a restricted release when the license is terminated. Therefore, the staff believes that the regulations should be amended to require the licensee to submit a cost estimate for unrestricted release and to obtain NRC approval of its DFP. Some exceptions would be made for existing licensees. Existing licensees would be offered the option to demonstrate their ability to meet restricted release criteria by submitting and obtaining approval for DPs proposing restricted release. After receiving DP approval, they could submit DFPs with the approved restricted release cost estimates and provide financial assurance for those amounts. Alternatively, existing licensees could seek NRC's acceptance of their plans for institutional controls and independent third party arrangements, rather than a complete DP. Future license applicants would not be offered the option to submit restricted release cost estimates. Rather, they would be required to submit DFPs and financial assurance for unrestricted release. This recommendation should be implemented by amending the regulations.

3.2 Operational Indicators of Increasing Costs

The list of events that can increase decommissioning costs includes:

1) Spills
2) Groundwater and soil contamination
3) Increased waste inventory
4) Increased waste disposal costs
5) Facility modifications
6) Changes in authorized possession limits
7) Actual remediation costs that exceed the initial cost estimate
8) On-site disposal
9) Use of settling ponds

Regulatory methods that may reduce the occurrence of soil and groundwater contamination are discussed in Attachment 8 of this paper. Potential criteria for NRC approval of on-site disposal are discussed in Attachment 4 of this paper. Because these issues can affect the cost of decommissioning, they are included in the list of triggering events.

These events should trigger the licensee to reevaluate its decommissioning cost estimate and adjust the level of financial assurance to cover any increase in cost. However, in practice, licensees often have not done so. The first specific time defined by the regulations to update the cost estimate is when the decommissioning plan is submitted. As a result, the cost estimate may not be updated until after operations cease and the licensee applies for license termination. In some cases, license conditions require adjustment for inflation, but they do not address trigger events such as those listed above.

The effect of on-site disposal on decommissioning cost depends on the radiological impact of the disposal. Attachment 4 of this paper discusses several radiological criteria that could be used for approving on-site disposal. On-site disposal is mentioned because such action should trigger an evaluation of the effect it may have on the licensee's decommissioning costs.

The Commission took a first step toward the goal of keeping licensee cost estimates up to date with the issuance of a notice of proposed rulemaking on October 7, 2002, which will, among other things, require a licensee to adjust its cost estimate every 3 years. However, the rulemaking was prepared primarily to account for inflation in the minimum cost of decommissioning since the original rule was issued in 1988. The Commission did not significantly alter the proposed rule with regard to DFPs because that would have delayed its issuance. Consequently, the proposed rule did not address the trigger events noted above. The staff believes that the occurrence of a trigger event should result in timely reassessment of the decommissioning costs, taking the event into account, before the passage of 3 years, as contemplated by the proposed rule on updating financial assurance for inflation. Early recognition of increased costs increases the licensee's ability to finance its costs. It also provides an incentive to reduce the number of events that spread contamination or otherwise increase decommissioning costs.

Therefore, the regulations should be revised to require a licensee to reevaluate its decommissioning cost estimate, and, if necessary, provide additional financial assurance to cover higher costs, within a reasonable time after an operational event that indicates a potential for increasing decommissioning costs.

3.3 Unavailability of Funds in Bankruptcy Where Financial Assurance Is Provided by Parent Company or Self-Guarantee

The parent company and self-guarantee methods of financial assurance permit a licensee whose assets are large in comparison to its decommissioning liability to guarantee its own decommissioning cost estimate. The guarantor must have substantial assets in the United States, a tangible net worth of at least $10 million, and meet certain financial ratios or bond ratings requirements. To qualify to use these methods, the licensee must submit a financial test to demonstrate compliance with the criteria listed, and provide a written guarantee agreement. The essence of the agreement is that the guarantor will either carry out the decommissioning, or set up a fund in favor of NRC in the amount of the current decommissioning cost estimate. However, a parent company or self-guarantee does not require the guarantor to set aside any funds unless the licensee fails to carry out decommissioning. As a result, during operation there is no requirement to set aside funds because the licensee is not in decommissioning.

The lack of actual funding makes the parent company and self-guarantee vulnerable in the event of bankruptcy. Bankruptcy law imposes an automatic stay on fund transfers, which would prevent the funding of a decommissioning trust from general funds if the licensee were to enter bankruptcy. (Funding arrangements made before the bankruptcy occurs, such as prepayment into a segregated account, or third-party guarantees, are free from this vulnerability.) Although the financial criteria were selected to provide early warning of a licensee's deteriorating financial position, recent bankruptcies of very large corporations (e.g., Enron, Worldcom) demonstrate that bankruptcy can follow rather quickly after financial problems are revealed. Consequently, one of the events that make financial assurance necessary, bankruptcy, would in itself prevent payment of funds for decommissioning, at least until resolution of the bankruptcy proceeding.

Another consideration arises from the priority of debt payments in bankruptcy. As currently structured, the parent company and self-guarantee can be viewed as unsecured debts. Under that theory, no funds reach NRC (as an unsecured creditor) until after at least three higher-priority debt classes are satisfied: debtor financing provided specifically for the bankruptcy, administrative claims, and secured debt. Environmental obligations, such as decommissioning costs, sometimes receive priority treatment as administrative claims, but that treatment is not assured. Amending the regulation to restructure the parent company and self-guarantee as secured debt, requiring collateral, would raise the obligation to secured debt status. Such action would improve the chance of recovery in bankruptcy as compared with treatment as unsecured debt. On the other hand, a secured debt structure may preempt treatment as higher priority debt under an administrative claim theory. The ability to recover funds for decommissioning depends on the priority of the claim as well as the amount of competing debt. Where the decommissioning obligation receives low-priority treatment, even if sufficient funds exist to pay for decommissioning, the licensee may not be required to make payment to the decommissioning trust fund, because higher priority debt may deplete the available funds.

Balanced against the concern over vulnerability is NRC's experience that no licensee providing a parent company or self-guarantee has entered bankruptcy or has failed to proceed with decommissioning projects in an adequate manner. Approximately 34 companies use these methods to provide financial assurance for 48 licenses, as of December 2002. Using these methods, the licensees reduce their financing costs for providing financial assurance. To provide the same amount of assurance using letters of credit would cost about $8 million per year in aggregate.

Therefore, because of the competing interests involved, the staff proposes to seek additional comment through a rulemaking on the need to change the parent company and self-guarantee methods of financial assurance.

3.4 Inadequate Financial Disclosure for the Parent Company and Self-guarantee Methods of Financial Assurance

The bankruptcies of very large corporations in 2000 and 2001 indicate that inadequate financial disclosures can potentially result in a licensee being unable to fund its decommissioning obligations. Although, the staff has not observed an example of an NRC licensee whose decommissioning funding fell short because of inadequate disclosure of the licensee's financial position, the potential vulnerability of the parent company and self-guarantee methods raises concerns.

Importantly, NRC relies on the licensee's financial statements and auditor's opinion as part of the financial test that the licensee qualifies to use the parent company and self-guarantee methods. It is legal and accepted that some liabilities can be kept off the corporation's balance sheet.

Where off-balance sheet liabilities are large, financial tests based on the financial statements may not be a reliable indicator of the guarantor's ability to pay decommissioning costs for the licensee.

Therefore, the staff believes that rulemaking is needed to require additional assurance of the availability of funds for decommissioning. A licensee with a parent company or self-guarantee should be required to provide a certification that its financial statements do not omit any off-balance sheet liabilities that could prevent it from meeting the financial test.

Adding the proposed certification to the regulations would allow the Commission to impose criminal and civil penalties on a licensee that fails to make an adequate disclosure of its financial position. The certification would include language alerting the licensee that criminal penalties could be imposed if it willfully violated its duty to provide adequate disclosure. The certification would further alert the licensee that failure to provide adequate disclosure could result in the assessment of civil penalties. The penalties would be imposed under the provisions of existing law.

3.5 Reaching Assets after Corporate Reorganization If Financial Assurance Proves Inadequate

Safety Light and Sequoyah Fuels exemplify the risk that corporate reorganization can insulate a parent company from the obligations of its subsidiary licensee. In both cases, the parent company successfully sequestered the decommissioning liability of its NRC-licensed subsidiary to the subsidiary itself.

In the Safety Light case, the parent company reorganized in violation of NRC regulations by transferring ownership of the facility to a subsidiary without NRC approval. The effect of the structural change was to leave Safety Light with few assets and low levels of profits after transfer payments were made between subsidiaries. The licensee subsidiary has no means to fund more than a small portion of its decommissioning costs. The cost of litigation to obtain assets from the parent company appears to exceed the value of additional payments that may be obtainable from the parent company.

Sequoyah Fuels presented a different scenario. Sequoyah was purchased by General Atomic about the time the financial assurance regulations were issued. Sequoyah contended, persuasively, that because its license had not been renewed, it was not required to provide financial assurance beyond the minimum amount of $750,000. The staff estimated that the decommissioning could cost up to $87 million. Consequently, NRC ordered the corporate parent, General Atomic, to provide financial assurance. However, General Atomic successfully resisted the Order on the basis that NRC could not enforce an Order against a third-tier parent company without a showing of wrongdoing. NRC accepted financial assurance of $9 million, less taxes, to resolve the matter. The funds are held in escrow. Although NRC accepted less than full coverage for financial assurance, the licensee must still pay the full cost of decommissioning. Sequoyah continues to remediate the site using other funds.

A hypothetical case will illustrate the potential vulnerability of financial assurance to corporate reorganization. A parent company desiring to limit its environmental liability could set up its NRC-licensed activity as a subsidiary, holding no assets other than the licensed facility. A license transfer may be required, but there likely would be no regulatory prohibition to the reorganization because the facility is already licensed. Financial assurance for the subsidiary could be provided by a letter of credit. However, under the assumptions of this hypothetical case, the subsidiary would have few assets and would not have the ability to obtain the credit on its own merits. The parent company would then provide the letter of credit on behalf of its

subsidiary. At this point, the parent company will have successfully limited its liability for decommissioning to the amount of the letter of credit. If the amount later proves to be inadequate, perhaps due to unanticipated groundwater contamination, the NRC will be unable to obtain an increase in funding from the limited assets of the licensee subsidiary . The parent company may allow the letter of credit to expire. That action would require the subsidiary to provide alternative financial assurance, but, as hypothesized, the subsidiary would be unable to do so. The parent company might not be held responsible, because the reorganization might block the NRC from enforcing an order against the parent to provide more funds.

To counter a licensee's efforts to insulate its decommissioning liabilities from the rest of its corporate structure, the staff is considering regulatory amendments. For example, the regulations could be amended to require the licensee to provide NRC with agreements that allow NRC to hold parent companies and subsidiaries liable for decommissioning costs, where this approach is sought. A similar result might be obtained by requiring the parent company to become a co-licensee, and adding a condition to the license addressing the parent company's obligation to pay for decommissioning if the subsidiary failed to do so.

3.6 Investment Losses Reduce Trust Account Balance below the Decommissioning Cost

The regulations require a licensee to cover the amount of its decommissioning cost estimate at the time it submits its DFP. A licensee must adjust its cost estimate and funding level periodically, but the current regulation does not specify what adjustment is required, nor what period may elapse between adjustments. Proposed regulations issued in October 2002 would define the time period between adjustments of the cost estimate, but did not address monitoring trust fund balances during the interim.

Consequently, a trust account is vulnerable to decline during the period between adjustments. In one case, the licensee estimated its decommissioning cost at $12.5 million. Its decommissioning trust fund consisted of a single common stock. On June 30, 2000, the fund value was $27 million. Two years later, on June 30, 2002, the value was $10 million.

Therefore, the staff believes additional regulation is necessary to require the licensee to monitor, and, if necessary, adjust the levels of funds held in a decommissioning trust frequently enough to prevent the balance from falling below the amount needed to cover the cost estimate. The frequency of monitoring and adjustment will be addressed in the recommended rulemaking.

3.7 Accidental Release Increases Decommissioning Cost

Financial assurance provides funds to decommission a facility after normal operations. It was not intended to provide funds sufficient to pay for decommissioning after a large accidental release or contamination event. The business disruption of cleaning up a large accidental release may cause a licensee to decide to cease operations. In that case, the cost of decontaminating the facility may overwhelm the decommissioning fund. However, materials licensees are not required to carry onsite property damage insurance to cover the cost of an accidental release.

In contrast to materials licensees, reactor operators are required to obtain onsite property damage insurance to provide assurance that funds for cleaning up an accidental release will be available if needed. (10 CFR 50.54(w)). (This insurance is separate from the offsite liability insurance provided under the Price-Anderson arrangement.) The licensee may not use the decommissioning fund to pay for the cleanup of an accidental release. Instead, it must use other funds, such as insurance proceeds, to first clean up its site to a point within the normal

range of contamination consistent with normal operation. It may then elect to either resume operations or apply for license termination. This arrangement provides additional assurance that decommissioning funds will be adequate, even after a large contamination event.

The staff believes a similar onsite property damage requirement for materials licensees is appropriate. The amount of insurance coverage would be scaled to the risk and consequences of an accidental release. The risk and consequence concerns discussed in section 4.2 of Attachment 8 would be considered in determining the need for and amount of insurance to clean up after an accidental release. Therefore, the staff recommends amending the regulations to require licensees to obtain onsite property damage insurance to cover the cost of cleaning up an accidental release.

4. EVALUATION OF OPTIONS

4.1 Restricted Release Assumption Causes Underestimation of Decommissioning Costs

Option 4.1.1: Revise guidance to encourage realistic assessment of decommissioning options, prescribe conditions that should be assumed for calculating costs.

Pro:
1. Improved consistency and realism
2. Lower cost to NRC than regulatory change

Con:
1. Not enforceable

Option 4.1.2: Issue guidance for calculating the spread of contamination for purposes of determining decommissioning cost.

Pro:
1. Consistent, objective standard for waste volumes
2. Waste volume is major cost driver, single most effective change to increase accuracy.

Con:
1. Not enforceable
2. Without reliable subsurface and groundwater data, the calculation has large uncertainty.

Option 4.1.3: Revise regulation to provide for NRC approval of the decommissioning funding plan (DFP) and to require licensees to provide a DFP and financial assurance based on unrestricted release. Provide existing licensees with the option to provide financial assurance for restricted release if the licensee submits and receives NRC approval of a decommissioning plan (DP) demonstrating its ability to meet restricted use criteria, or, alternatively, if the licensee implements institutional controls and obtains third party oversight for a restricted release.

Pro:
1. Greatest consistency
2. NRC approval
3. Enforceable
4. Avoids shortfall if restricted release cannot be achieved
5. Defines end state during operating period

Con:
1. Higher development and implementation cost

2. Some licensees may be unable to provide full coverage financial assurance if they relied on restricted release assumptions in the past.

4.2 Operational Indicators of Increasing Costs

Option 4.2.1: Increase scope of inspections to determine whether licensee site conditions indicate potential for increased decommissioning costs.

Pro: 1. Most direct method of determining changes in site conditions

Con: 1. Relatively high resource consumption

Option 4.2.2: Provide guidance to licensees to perform annual determination of whether site conditions indicate potential for increased decommissioning costs.

Pro: 1. Licensee has most immediate knowledge of changing site conditions.
2. Would provide additional focus for onsite inspections by NRC.

Con: 1. Not enforceable

Option 4.2.3: Revise regulation to require a licensee to re-evaluate its decommissioning cost estimate, and, if necessary, provide additional financial assurance to cover higher costs, within a reasonable time after an operational event that indicates a potential for increasing decommissioning costs. Operational indicators would include: spills and spread of contamination, groundwater contamination, and other events.

Pro: 1. Highest level of consistency between licensees
2. Enforceable
3. Promotes earlier characterization of the spread of contamination.
4. Reduces period of inadequate financial assurance coverage.
5. Provides additional incentive to avoid spread of contamination.

Con: 1. Rulemaking resources required
2. Increased costs of financial assurance
3. Some licensees may be unable to obtain increased financial assurance

Option 4.2.4: Revise regulation, for sites with large radioactive material throughput or liquid processes, to require licensee to periodically obtain subsurface soil and groundwater contamination data, to update its decommissioning cost estimate.

Pro: 1. Removes uncertainty of the dominant cost driver
2. Reduces likelihood of funding shortfalls.
3. Provides evidence of need to increase decommissioning fund if contamination spreads.
4. Enforceable

Con: 1. Cost to licensee
2. Requires rulemaking resources.

4.3 Unavailability of Funds in Bankruptcy Where Financial Assurance Is Provided by Parent Company or Self-guarantee.

Option 4.3.1: Revise regulation to revise financial test to require greater safety margin in case of bankruptcy

Pro:
1. Relatively simple change
2. Retains current regulatory structure.
3. Retains benefit of lower financial assurance costs for most licensees.

Con:
1. Rulemaking resources required
2. Some licensees now using the method may be unable to meet revised test.
3. Provides little increase in financial assurance where fraud-induced bankruptcy renders the licensee incapable of funding decommissioning.

Option 4.3.2: Revise regulation to eliminate the parent company and self-guarantee methods of financial assurance.

Pro:
1. Straightforward change
2. Significantly reduces effects of bankruptcy from interfering with decommissioning funding.

Con:
1. Increases cost of financial assurance for licensees.
2. May lead to shutdown of marginally profitable licensees.
3. No examples where a licensee failed to meet its guarantee agreement
4. Rulemaking resources required

Option 4.3.3: Revise regulation to require licensees to increase their frequency of performing and reporting the financial test.

Pro:
1. Provides earlier warning of deteriorating financial position.
2. Does not make method unavailable to any existing user.
3. Retains benefit of lower financial assurance costs for licensee.

Con:
1. Rulemaking resources required
2. Provides little increase in financial assurance where fraud-induced bankruptcy renders the licensee incapable of funding decommissioning.

Option 4.3.4: Request comments on options under consideration for changing the parent company and self-guarantee mechanisms in notice of proposed rulemaking.

Pro:
1. Provides information potentially useful to assess the risk of failure of the parent company and self-guarantee methods.
2. If changes are considered necessary, focuses staff resources on options most likely to improve financial assurance.

Con:
1. Resources required to assess information provided

4.4 Inadequate Financial Disclosure for the Parent Company and Self-guarantee Methods of Financial Assurance

Option 4.4.1: Revise regulation to require licensee with a parent or self-guarantee to provide additional certification that its financial statements do not omit off-balance sheet liabilities that would prevent it from meeting the financial test.

Pro: 1. Provides additional assurance that off-balance sheet liabilities permitted by accounting rules do not significantly reduce the level of financial assurance provided by the licensee.
2. Provides means to impose civil or criminal penalties on a licensee that fails to adequately disclose its financial position.

Con: 1. Rulemaking resources required

Option 4.4.2: Retain a financial consultant to perform in-depth review of the licensee's financial statements for those licensees that use a parent company or self-guarantee.

Pro: 1. Does not require rulemaking.
2. May be more likely to uncover hidden liabilities.

Con: 1. Relatively expensive, especially for large licensees

4.5 Reaching Assets after Corporate Reorganization If Financial Assurance Proves Inadequate

Option 4.5.1: Revise regulation to require licensees to provide NRC with agreements that allow NRC to hold parent companies and subsidiaries liable for decommissioning costs. As part of the rulemaking, consider requiring the parent company of licensee subsidiaries to be a co-licensee.

Pro: 1. Increases assets available for decommissioning.
2. Limits the potential that payment for decommissioning will fall short if financial assurance coverage proves inadequate.
3. Reduces litigation costs to NRC to reach assets.

Con: 1. Rulemaking resources required

4.6 Investment Losses Reduce Trust Account Balance below the Decommissioning Cost

Option 4.6.1: Where decommissioning funds are held in investments that may suffer market losses, revise regulation to require licensee to perform periodic comparison of actual amount of funds in trust to its decommissioning funding requirement, make up any shortfall, and report the funding addition to the NRC.

Pro: 1. Reduces the impact of making up funding shortfalls by limiting the time a market decline will go unnoticed by the licensee.
2. Reduces likelihood that shortfall will exceed licensee's ability to pay.
3. Minimizes the time a licensee may have inadequate funding.
4. Encourages licensee to change investment strategy if losses continue.

Con: 1. Additional administrative burden on licensee.
2. Rulemaking resources required.
3. A changing market may make this difficult to implement.

4. Licensees in a declining market may not have the resources to make up the losses.
5. May need a process to remove excess funds when the market rebounds.

Option 4.6.2: Revise regulation to require decommissioning trust fund investments in U.S. Federal Government guaranteed securities.

Pro: 1. Eliminates market risk if held to maturity
2. Minimizes need to monitor performance of trustee

Con: 1. Minimizes potential return on investment
2. Increases costs to licensee

4.7 Accidental Release Increases Decommissioning Cost

Option 4.7.1: Revise regulation to require licensee to obtain onsite property damage insurance to cover the cost of cleaning up accidental releases.

Pro: 1. Assure that accidental release does not increase decommissioning cost above the amount of financial assurance
2. Inspections by insurance provider will encourage licensee efforts to minimize likelihood of an accidental release.

Con: 1. Rulemaking resources required
2. Cost to licensees

5. RECOMMENDATIONS

The recommendations for regulatory changes discussed below are preliminary; further evaluation of cost/benefit during the rulemaking process will be needed to determine the most appropriate specific revisions that should be made.

5.1 Initial Underestimation of Decommissioning Cost:

Recommend Option 4.1.3: Revise regulation to provide for NRC approval of the decommissioning funding plan (DFP) and to require licensees to provide a DFP and financial assurance based on unrestricted release. Provide existing licensees with the option to provide financial assurance for restricted release if the licensee submits and receives NRC approval of a decommissioning plan (DP) demonstrating its ability to meet restricted use criteria, or, alternatively, if the licensee implements institutional controls and obtains third party oversight for a restricted release.

5.2 Operational Indicators of Increasing Costs

Recommend Option 4.2.3: Revise regulation to require a licensee to re-evaluate its decommissioning cost estimate, and, if necessary, provide additional financial assurance to cover higher costs, within a reasonable time after an operational event that indicates a potential for increasing decommissioning costs. Operational indicators would include: spills and spread of contamination, groundwater contamination, and other events.

Recommend Option 4.2.4: Revise regulation, for sites with large radioactive material throughput or liquid processes, to require licensee to periodically obtain subsurface soil and groundwater contamination data to update its decommissioning cost estimate.

5.3 Unavailability of Funds in Bankruptcy Where Financial Assurance Is Provided by Parent Company or Self-guarantee

Recommend Option 4.3.4: Request comments on options under consideration for changing the parent company and self-guarantee mechanisms in a notice of proposed rulemaking beyond the recommendation in 5.5.

5.4 Inadequate Financial Disclosure

Recommend Option 4.4.1: Revise regulation to require licensee with a parent or self-guarantee to provide additional certification that its financial statements do not omit off-balance sheet liabilities that would prevent it from meeting the financial test.

5.5 Reaching Assets after Corporate Reorganization If Financial Assurance Proves Inadequate

Recommend Option 4.5.1: Revise regulation to require licensees to provide NRC with agreements that allow NRC to hold parent companies and subsidiaries liable for decommissioning costs. As part of the rulemaking, consider requiring the parent company of licensee subsidiaries to be a co-licensee.

5.6 Investment Losses Reduce Trust Account Balance

Recommend Option 4.6.1: Where decommissioning funds are held in investments that may suffer market losses, revise regulation to require licensee to perform periodic comparison of actual amount of funds in trust to its decommissioning funding requirement, make up any shortfall, and report the funding addition to NRC.

5.7 Accidental Release Increases Decommissioning Cost

Recommend Option 4.7.1: Revise regulation to require certain licensees to obtain onsite property damage insurance to cover the cost of cleaning up accidental releases.

RESULTS OF EVALUATIONS FOR MEASURES TO PREVENT
FUTURE LEGACY SITES BY CHANGES IN LICENSEE OPERATIONS

1. BACKGROUND

Following a General Accounting Office recommendation, the U.S. Nuclear Regulatory Commission (NRC) initiated the Site decommissioning Management Program (SDMP) in 1990. The purpose of this program is to focus management attention on remediation of sites that have ceased operation, have significant residual contamination and limited financial resources. Experience has shown that the cost of remediation of these sites is typically very high, in the tens of millions of dollars, because there are large volumes of contaminated material and, often, significant ground water contamination. Both are very expensive to alleviate. In addition to the high cost to the licensees, these sites also require considerable staff resources to effect remediation. Therefore, it is considered prudent to institute measures to reduce the occurrence of such sites in the future.

2. ISSUES DESCRIPTIONS AND DESIRED OUTCOMES

Issues: A number of legacy sites have substantial contamination: approximately two thirds have subsurface soil contamination, and one third also have ground water contamination (this depends on the solubility of the nuclides). These sites operated before the current regulatory decommissioning infrastructure existed. Could more be done through rulemaking, guidance development, or changes to existing operating licenses?

Desired Outcomes: Make changes to the regulatory environment to minimize the potential for legacy sites to occur in the future.

3. EVALUATIONS

3.1 Factors That Could Cause Future Legacy Sites

The information about the existing SDMP sites, especially those proposing restricted release under 10 CFR 20.1403, was reviewed in detail. Two specific factors were condensed from the information about these sites: they had chronic releases of radioactive material to the subsurface environment, NRC did not recognize the extent of this contamination until near cessation of operations.

3.1.1 Chronic releases

Facilities that process large quantities of material, especially in liquid form, have the potential for significant environmental contamination. These facilities are more closely related to chemical processing plants than typical nuclear facilities, such as nuclear power plants (NPPs). As such, the processes tend to be operated to minimize costs and maximize product and profit. This philosophy allows for “wasting” spillage within existing requirements, rather than expending time and money to clean it up; it also engenders limited controls of processes. Staff experience has shown that these operating conditions lead to large amounts of chemical and long-lived

radioactive contamination being released to the subsurface environment over an extended period of time. The acute doses from these releases are below the limits in 10 CFR Part 20 that would initiate regulatory action.

Another common factor is that the cost to dispose of radioactive material, even that with relatively low concentrations, can be very high; contributing elements include packaging, transportation to the few licensed sites, and surcharges on the disposal itself. The cost of disposal may affect their business practices. For example, they may rely more on storing waste, perhaps in settling ponds, rather than in shipping waste to minimize on-site storage. In addition to historic trend of increasing disposal costs, this could increase the opportunity for environmental contamination from pond releases. Such releases could result in substantially higher cost to remediate -- possibly exceeding available financial resources -- at the time of license termination.

3.1.2 Late identification of conditions

Past regulatory oversight of processors of licensed material where there was no potential for nuclear criticality has historically been limited. It focused on such facilities only after repeated problems -- primarily worker exposure -- were identified by summary oversight. This has allowed less serious, but, in some cases, chronic operational weaknesses to go unremarked. The result has been low-level, but long-term, releases of radioactive material to the subsurface environment. Because the radioactive materials combine with subsurface soil or ground water, these releases do not cause immediate exposure to either workers or the public that approach the limits specified in 10 CFR Part 20. It is only when the possible results of unlimited access to the site, and associated exposure pathways -- ingestion, inhalation, etc. -- are being evaluated that the extent of contamination becomes of interest. Often, NRC first becomes cognizant of the extent of the contamination as part of the review of the decommissioning plan, that includes a description of site conditions(site characterization).

3.2 Regulatory Tools and Their Effectiveness

3.2.1 Existing regulations

There are several existing regulations that provide the staff 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. Examples of these are given below.

Code of Federal Regulations: 10 CFR Part 19 specifies notices and inspections, but is focused primarily on events related to short-term worker exposures.

10 CFR Part 20 provides requirements for protection of the public and workers from excessive exposure to radiation. The emphasis is on preventing and mitigating events that could result in imminent exposures, not projected long-term exposures. The philosophy of including exposures from unremediated sites and to include future, long-term conditions may require rulemaking. For example, 10 CFR 20.1406 specifies that **new** licensees should design and operate facilities to minimize contamination and radioactive waste. This requirement does not apply to existing

licenses. Part 20 also supports a vigorous enforcement program, but current focus is, as above, on events resulting in actual or potential immediate exposures.

10 CFR Part 21 is focused on component failures, rather than the effects. The "substantial safety hazard" specified in Section 21.21 is generally interpreted to mean events resulting in short-term worker exposure, rather than long-term environmental hazards, such as ground water contamination.

10 CFR 40.32 specifies that for certain facilities or "... any other activity that the Commission determines will significantly affect the quality of the environment ...." the staff shall include the environmental benefits and costs in its evaluation, and issue a license "... with appropriate conditions to protect environmental values." Environmental reviews that include potential future subsurface and ground water contamination are not currently explicitly required.

10 CFR 40.36 and 40.42 (and equivalent Sections in 10 CFR Parts 30, 70, and 72) specify that upon application, licensees must have a decommissioning funding plan based on current estimates of total decommissioning costs, and financial assurance to support it. Section 40.42 also specifies that part of the decommissioning plan must be an accurate statement of the radiological condition of the site. This, however, only occurs at the end of licensed operations. There are no requirements for licensees to **periodically** report the radiological condition of the site, especially any subsurface contamination, in conjunction with updating costs estimates for decommissioning funding and financial assurance.

3.2.2 Existing guidance

Guidance related to environmental analyses states that effects of subsurface contamination should be included, but ther are no specifics on what and when to collect the data. Further, such contamination is generally considered at the time of license termination, when the impacts have already occurred.

There are numerous manual chapters (MCs) and inspection procedures in the Inspection Manual that address short-term conditions. While not specifically focused on long-term environmental issues, these could be readily extended to apply. For example, Inspection Procedure IP 42700, that specifies review of plant procedures, could be used to review plant response to periodic spills, excessive effluent releases, etc. IP 62709 is based on the NPP Maintenance Rule for identifying performance- and risk-based indicators; it could also be used for materials sites, or plant-specific indicators developed within the existing framework. IP 71846 specifically identifies clean up of spills as an inspection item; and IP 84750 addresses how an NPP licensee effectively controls, monitors, and quantifies releases of radioactive materials in liquid, gaseous, and particulate forms to the environment. In combination, these could address potential subsurface contamination issues at any site.

4. Evaluation of Options to Change Regulatory Tools

4.1 Option 1: Require Existing Licensees to Minimize Contamination

In this option, all licensees would be required to design and operate facilities to minimize contamination. This could be achieved by:

4.1.1 Revising 10 CFR 20.1406 by removing the “other than renewals” exemption

Pro: This puts all licensees on same basis.
This “front loads” the costs, rather than waiting to end-of-life when limited revenue controls resources.

Con: This could require substantial physical changes for existing plants.
This requires rule making.

4.1.2 Inserting license conditions at next renewal, using the authority of 10 CFR 40.32(e) and 40.41(e), and equivalent Sections in 10 CFR Parts 30, 70, and 72.

Pro: This puts all licensees on same basis.
“This “front loads” the costs, rather than waiting to end-of-life when limited revenue controls resources.
This does not require rule making.

Con: This could require substantial changes and costs for existing plants.
This would be a change from past practice.

4.2 Option 2: Increased Environmental Monitoring, Reporting and Remediation

Licensees with higher risk for potential subsurface contamination should establish an effective monitoring and reporting program that includes characterization of the subsurface - - geology, hydrology, etc. -- prior to operations, and routinely perform subsurface monitoring to identify the existence of contamination from operations. Some events would require prompt remediation; others could employ additional financial assurance. Risk of contamination would need to be defined, but includes facilities with large volumes of long-lived radionuclides, large throughput and liquid process. This could be achieved by:

4.2.1 Revising 10 CFR 40.31 - 40.32, and equivalent Sections in 10 CFR Parts 30, 70, and 72, to add specific monitoring and reporting requirements; or revise §40.36, etc., to add specific routine licensee reports regarding the condition of the site, including subsurface.

Pro: This focuses resources on early detection of potential problems by monitoring.
This provides clear regulatory basis for routine monitoring and reporting.
This provides a clear regulatory link between the physical condition of the site and the amount of financial assurance.

Con: This adds to the costs of licensing and operations.
This requires additional NRC resources to review.
This requires rule making.

4.2.2 Revising 10 CFR 40.31 - 40.32, and 40.36, and equivalent Sections in 10 CFR Parts 30, 70, and 72, to add specific requirements to either remediate subsurface contamination promptly or increase financial assurance for the full cost of later remediation.

Pro: This encourages clean operations by imposing a short term cost to remediation.
This reduces the amount of contamination remaining at end of life.
This provides adequate financial assurance for future remediation.

Con: This require staff judgement to determine which events require prompt remediation.
This adds to the cost of interim remediation or financial assurance.
This requires rule making.

4.2.3 Adding specific inspection items to MC 2616 to review subsurface contamination data; or extending Manual Chapter and Inspection Procedures from reactors related to risk-based evaluations to materials sites.

Pro: This focuses resources on potential long-term, environmental problems.
This uses existing guidance to the extent practicable.
This does not require rule making.

Con: This requires additional inspection resources.
This requires additional inspector qualifications in geology, hydrology, etc.
This requires a change of inspection guidance.
This may require substantial staff effort to develop risk-based indicators.

Current regulations and policy allow for these, but do not compel them. For example, Part 20 specifies environmental monitoring; and several MCs/IPs for reactors that focus on performance indicators, risk-based evaluation, etc., could be applied directly to materials sites to achieve this. However, current practice is to focus on potential/events resulting in immediate exposures.

The addition of appropriate license conditions and additional focus during inspections could identify potential problems early. This may need additional inspection resources or a formal risk-based allocation of existing resources that includes long-term conditions.

4.3 Option 3: Revise guidance to better focus enforcement on environmental contamination (non-compliances).

Current guidance and practice do not emphasize enforcement for materials sites which do not have a possibility of nuclear criticality or significant exposure hazard. Guidance which explicitly acknowledges the potential for enforcement sanctions for non-compliances associated with long-term events that result in environmental contamination would encourage licensees to prevent such contamination. In addition, such guidance would help to focus enforcement actions to ensure appropriate licensee corrective action to mitigate the resulting contamination and prevent and/or minimize additional contamination events. This would result in added emphasis on, for example, 10 CFR Section 20.1501 (Surveys and Monitoring), Section 20.2103 (Records of Surveys), Section 20.2203 (Reports of ... radioactive material exceeding constraints or limits), Section 40.36 (record keeping for decommissioning), etc.

Pro: Focuses licensee attention on environmental issues
Assists in identifying problem facilities

Early identification of potential problems, and trenchant emphasis on timely remediation

Con: Change from NRC emphasis on short term exposures

5. RECOMMENDATIONS

The recommendations for regulatory changes are discussed below; further evaluation of cost/benefit during the rulemaking process will be needed to determine the most appropriate specific revisions that should be made.

Chronic Releases

8.1. Revise requirement (10 CFR 20.1406) to remove the "other than renewals" statement, so that both current licensees and new applicants are required to design and operate facilities to minimize contamination. For existing licensees, the emphasis should be on procedural changes. Physical changes to the facility should be made only when procedures fail to reduce releases. There should be a cost-risk-benefit analysis evaluating effects of potential contamination. For example, contamination that impacts groundwater could migrate through large volumes of the subsurface, and potentially beyond the site boundary. This would result in a large cost to remediate, that could be avoided by an investment in prevention. Implement in a rulemaking, revised guidance, and a RIS.

8.2. Increase emphasis on the potential for enforcement sanctions for non-compliances with the requirements related to surveys and monitoring, records of operational and environmental releases, reporting, etc. (i.e., 10 CFR Sections 20.1500, 20.2100, 20.2200, and 40.36). Take enforcement actions, as appropriate, to better focus licensee response to environmental contamination problems resulting from such non-compliances. Implement in revised enforcement guidance and a RIS.

Reporting Deficiencies

8.3. Develop a risk-informed approach that includes requiring definition of sites with "high risk" of subsurface contamination as those with large volumes of long-lived radionuclides, large throughput, or liquid processes. Implement in a rulemaking, revised guidance, and a RIS.

8.4. Implement the risk-informed approach (Recommendation 8.3) to require specific monitoring and reporting programs including subsurface characterization, monitoring, and reporting under two conditions:

1) For sites with "high risk", at license application or renewal, a minimum plan to define and monitor the subsurface (e.g., three to five wells to identify geologic and hydrologic characteristics of the site), and an annual report of the concentrations of contaminants of concern;

2) For all sites, on experiencing events(s) that contaminate the subsurface, an expanded monitoring and reporting program that adds wells to fully characterize the extent and migration of resultant plume(s), and more frequent monitoring and reporting, approximately quarterly. This would be done in conjunction with financial assurance requirements. Implement in a rulemaking, revised guidance, and RIS.

8.5. Implement the risk-informed approach (Recommendation 8.3) to increase NRC's inspection focus on sites with "high risk" of environmental contamination concerns by:

1) Increasing inspector qualifications in hydrology, geology, etc.;

2) Increasing inspections and inspector evaluations of record keeping requirements [i.e., 10 CFR 20.1501 (Surveys and Monitoring); 10 CFR 20.2103 (Records of Surveys); 10 CFR 20.2203 (Reports of radioactive material exceeding constraints or limits);

3) Increasing inspections and inspector evaluations of record keeping requirements of 10 CFR 40.36 and others to identify potential problems early; and

4) Modifying Manual Chapter 2600, to include performance- and risk-informed evaluations, using those in Manual Chapter 2500 as examples.

Implement in revised inspection procedures and a RIS.

PLANNED EVALUATIONS FOR APPROPRIATENESS OF
ALLOWING INTENTIONAL MIXING OF CONTAMINATED SOIL UNDER THE LTR

1. BACKGROUND

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. While no specific regulation addresses mixing, intentional mixing of contaminated soil with non-contaminated soil is not generally permitted by the staff. However, there may be advantages financially or in exposure reduction to allowing intentional mixing, under certain limited circumstances.

This is a new issue that the staff has identified subsequent to SECY-02-0177 that identified the License Termination Rule (LTR) issues. Because it was identified late in the staff's analysis and preparation of this Commission Paper, only planned evaluations are provided at this time along with a schedule to provide the results of the staff's evaluations in a September 2003 Commission Paper.

2. ISSUE DESCRIPTION AND EVENTUAL DESIRED OUTCOME

2.1 Issue: The appropriateness of allowing intentional mixing of contaminated soil for meeting release criteria should be evaluated as an option under the LTR.

2.2 Desired Outcome: Decide whether it is appropriate to allow mixing of contaminated soil to meet release criteria (either restricted or unrestricted or both), and, if appropriate, recommend actions, such as new guidance to implement allowable mixing.

3. PLANNED EVALUATIONS

3.1 Evaluate existing and planned regulations and directives for remediation of contaminated facilities from international and national sources [e.g., International Atomic Energy Agency; U.S. Environmental Protection Agency (EPA); U.S. Department of Energy (DOE); U.S. Department of Defense (DoD); and individual States] to identify current policies and the bases for intentional mixing of contaminated soils.

3.2 Evaluate existing U.S. Nuclear Regulatory Commission (NRC) policies and experiences on rulemaking (especially the recent 10 CFR Part 40 proposed rule on unimportant quantities of source material and 10 CFR 40.51(e)); license terminations (e.g., AAR Manufacturing Group, Inc., Apollo); and other projects/issues (e.g., comments on New Jersey regulations, letter to Texas Department of Health, response to Wyoming on American Nuclear Corporation Gas Hills mill tailings site) for statements/guidance prohibiting or allowing intentional mixing of contaminated soils, to illustrate current NRC policies. It should be noted that the recent rulemaking concerning 10 CFR 40.51(e), sought public comment on the issue of dilution.

3.3 Evaluate experiences and available insights of other groups [e.g., EPA Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closures; DOE; Corps of Engineers (for Formerly Utilized Sites Remedial Action Plan (FUSRAP) sites; and DoD (for Formerly Used Defense Sites, Closed, Transferring, and Transferred Facilities, and Base Realignment and Closures)] on policies and/or guidance provided on intentional mixing of contaminated soils.

3.4 Based on results of evaluations, determine the appropriateness of allowing intentional mixing of contaminated soil to meet release criteria of LTR.

3.5 If the staff determines that intentional mixing is appropriate, identify and recommend actions, such as new guidance and its bases, to implement allowable mixing.

COMBINED SET OF RECOMMENDED OPTIONS AND IMPLEMENTATION ACTIONS FOR ALL INDIVIDUAL LICENSE TERMINATION RULE ISSUES

The recommended options and implementation actions for each License Termination Rule (LTR) issue are provided below.

Restricted Release/Alternate Criteria and Institutional Control

1.1. Clarify the existing risk-informed graded approach for restricting use. Implement with revised guidance and a Regulatory Issue Summary (RIS).

1.2. Emphasize the availability of the option for restricting use with layered and redundant institutional controls with a independent third party that is also responsible for one of the institutional controls. Implement with revised guidance and a RIS.

1.3. Add a new option for restricting use by U. S. Nuclear Regulatory Commission (NRC) monitoring and enforcement of institutional controls, after license termination using either the regulation or legal agreement. Implement with revised guidance (that includes a model restrictive covenant) and a RIS.

1.4. Add a new option for restricting use by an NRC possession- only specific license. Implement with revised guidance and a RIS.

1.5 Note that the staff plans on continuing to monitor the U. S. Department of Energy's (DOE's) Long-Term Stewardship Program changes and reevaluate the potential for restricting use through future site transfers to DOE under the Nuclear Waste Policy Act, section151(b).

1.6 Note that the staff plans on continuing to monitor and participate, where beneficial to the staff, with cooperative, interagency activities to share information and develop solutions to long-term stewardship/institutional control issues (e.g., Environmental Council of States Long-Term Stewardship Subcommittee, DOE Long-Term Stewardship Roadmap development).

1.7 Note that the staff will continue to explore with licensees the use of the recommended approaches for restricted release, pending the Commission's deliberations. The staff will inform the Commission if a licensee is willing to adopt any of these approaches. In addition, if the Commission approves one or more of the options, the staff will seek to implement the option(s) in advance of the RIS and guidance, if it will further the decommissioning process.

Relationship between LTR Release Limits and Other Release Limits

Unimportant Quantities under 10 CFR 40.13(a)

2.1. As the elimination or resolution of inconsistency between the LTR and 10 CFR 40.13(a) is not a current possibility, the staff recommends clarifying that 10 CFR 40.13(a) should not be used as a decommissioning criterion. Implement with a RIS.

Appropriateness of Developing a Separate Unrestricted Release Standard for Uranium and Thorium

3.1 The staff acknowledges that there are some significant inconsistencies in the potential exposures allowed between 10 CFR 20.1402 and other regulations in 10 CFR Part 40. Although the staff is reevaluating some of these 10 CFR Part 40 regulations, the staff does not believe that they are applicable as unrestricted release criteria for source material specific licensees.

3.2 The staff has also found that there are only a limited number of existing source material sites that have not already sought unrestricted release that may find it necessary to cleanup to requirements other than those in 10 CFR 20.1402. If NRC jurisdiction of non-purposefully-used uranium and thorium is transferred to other agencies, as discussed in the JWG's paper, the number of existing NRC and Agreement State source material sites licensed under the AEA, and potential future licensees, would be further reduced. However, because the staff believes that it may be necessary to retain the SDMP/complex decommissioning sites under NRC jurisdiction, the recommendation of the JWG will not result in a significant reduction in the number of overall sites that would benefit from a separate unrestricted standard.

3.3 In summary, the staff believes that the opportunity provided by the existing LTR allows complex source material sites the flexibility to reduce burden through a graded approach (unrestricted use to restricted use to alternate criteria) that can be based on risk. Continued use of the LTR would also 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. As a result, the staff believes that given the flexibility in the existing regulations in 10 CFR 20.1402, 20.1403, and 20.1404,and in conjunction with the limited number of sites that may require cleanup to criteria other than those in 10 CFR 20.1402, it is not appropriate at this time to develop a separate unrestricted release standard for source material licensees. This issue should be discussed in a RIS.

On-Site Disposal under 10 CFR 20.2002

4.1 Continue the current practice of approving on-site disposals with 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. This option should be implemented with revised guidance and a Regulatory Issue Summary.

4.2 Permit 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 leaving this option available provides licensees with maximum flexibility under the existing regulation. Note that this issue is addressed in Attachment 7 as an indicator of the need for increased financial assurance.

Controlling the Disposition of Solid Materials

5.1 Describe the relationship between the LTR's unrestricted-release dose constraint and the existing case-by-case approach for controlling the disposition of solid materials. The staff's qualitative judgment, at this time, is that the LTR is protective of public health if materials are removed from a site after license termination for unrestricted use, mainly due to the conservatism in the LTR technical basis and current dose-modeling assumptions, ALARA considerations, and the effects of mixing when residual radioactivity is moved to other locations. This should be clarified in a Regulatory Issue Summary.

5.2 Note that insights from the ongoing technical development associated with the rulemaking effort on controlling the disposition of solid materials can be used in the development of a rationale to further explain the relationship between criteria in the LTR and those for controlling the disposition of solid materials, and support the current view that the LTR is protective of offsite releases after license termination for unrestricted use.

Realistic Exposure Scenarios

6.1. Clarify that more realistic exposure scenarios can be justified by licensees assuming reasonable foreseeable (e.g., a few decades and possibly up to 100 years) land use for the 1,000 year analysis time period. Implement in revised guidance and a RIS.

6.2 Note that the staff will provide to the Commission cases that may implement this approach in the near future for the AAR, Cabot-Revere, Michigan Department of Natural Resources, and Fansteel sites. In addition, if the Commission approves the recommended opition, the staff will seek to implement the option in advance of the RIS and guidance, if it will further the decommissioning process.

6.3 The staff continues to be committed to improving the other technical areas of dose modeling for decommissioning. These include improving the guidance, pursuing computer model improvements and development, and improving the state of knowledge on individual parameters and processes involved.

Measures to Prevent Future Legacy Sites

Changes to Financial Assurance

Initial Underestimation of Decommissioning Cost:

7.1 Revise regulation to provide for NRC approval of the decommissioning funding plan (DFP) and to require licensees to provide a DFP and financial assurance based on unrestricted release. Provide existing licensees with the option to provide financial assurance for restricted release if the licensee submits and receives NRC approval of a decommissioning plan (DP) demonstrating its ability to meet restricted use criteria, or alternatively, if the licensee implements institutional controls and obtains third party oversight for a restricted release. Implement with a rulemaking, new guidance, and a RIS.

Operational Indicators of Increasing Costs

7.2 Revise regulation to require a licensee to re-evaluate its decommissioning cost estimate, and, if necessary, provide additional financial assurance to cover

higher costs, within a reasonable time after an operational event that indicates a potential for increasing decommissioning costs. Operational indicators would include: spills and spread of contamination, groundwater contamination, and other events. Implement with a rulemaking, new guidance, and a RIS.

7.3 Revise regulation, for sites with large radioactive material throughput or liquid processes, to require licensee to periodically obtain subsurface soil and groundwater contamination data to update its decommissioning cost estimate. Implement with a rulemaking, new guidance, and a RIS.

Unavailability of Funds in Bankruptcy Where Financial Assurance Is Provided by Parent Company or Self-guarantee

7.4 Request comments on options under consideration for changing the parent company and self-guarantee mechanisms in a notice of proposed rulemaking, beyond the option in 7.6. Implement in the Federal Register Notice of a proposed rulemaking and a RIS.

Inadequate Financial Disclosure

7.5 Revise regulation to require licensee with a parent or self-guarantee to provide additional certification that its financial statements do not omit off-balance sheet liabilities that would prevent it from meeting the financial test. Implement with a rulemaking, new guidance, and a RIS.

Reaching Assets after Corporate Reorganization If Financial Assurance Proves Inadequate

7.6 Revise regulation to require licensees to provide NRC with agreements that allow NRC to hold parent companies and subsidiaries liable for decommissioning costs. As part of the rulemaking, consider requiring the parent company of licensee subsidiaries to be a co-licensee. Implement with a rulemaking, new guidance, and a RIS.

Investment Losses Reduce Trust Account Balance

7.7 Where decommissioning funds are held in investments that may suffer market losses, revise regulation to require licensee to perform periodic comparison of actual amount of funds in trust to its decommissioning funding requirement, make up any shortfall, and report the funding addition to NRC. Implement in a rulemaking, new guidance, and a RIS.

Accidental Release Increases Decommissioning Cost

7.8 Revise regulation to require certain licensees to obtain onsite property damage insurance to cover the cost of cleaning up accidental releases. Implement in a rulemaking, new guidance, and a RIS.

Changes in Licensee Operations

Chronic Releases

8.1. Revise requirement (10 CFR 20.1406) to remove the "other than renewals" statement, so that both current licensees and new applicants are required to design and operate facilities to minimize contamination. For existing licensees, the emphasis should be on procedural changes. Physical changes to the facility should be made only when procedures fail to reduce releases. There should be a cost-risk-benefit analysis evaluating effects of potential contamination. For example, contamination that impacts groundwater could migrate through large volumes of the subsurface, and potentially beyond the site boundary. This would result in a large cost to remediate, that could be avoided by an investment in prevention. Implement in a rulemaking, revised guidance, and a RIS.

8.2. Increase emphasis on the potential for enforcement sanctions for non-compliances with the requirements related to surveys and monitoring, records of operational and environmental releases, reporting, etc. (i.e., 10 CFR Sections 20.1500, 20.2100, 20.2200, and 40.36). Take enforcement actions, as appropriate, to better focus licensee response to environmental contamination problems resulting from such non-compliances. Implement in revised enforcement guidance and a RIS.

Reporting Deficiencies

8.3. Develop a risk-informed approach that includes requiring definition of sites with "high risk" of subsurface contamination as those with large volumes of long-lived radionuclides, large throughput, or liquid processes. Implement in a rulemaking, revised guidance, and a RIS.

8.4. Implement the risk-informed approach (Recommendation 8.3) to require specific monitoring and reporting programs including subsurface characterization, monitoring, and reporting under two conditions:

1) For sites with "high risk", at license application or renewal, a minimum plan to define and monitor the subsurface (e.g., three to five wells to identify geologic and hydrologic characteristics of the site), and an annual report of the concentrations of contaminants of concern;

2) For all sites, on experiencing events(s) that contaminate the subsurface, an expanded monitoring and reporting program that adds wells to fully characterize the extent and migration of resultant plume(s), and more frequent monitoring and reporting, approximately quarterly. This would be done in conjunction with financial assurance requirements. Implement in a rulemaking, revised guidance, and RIS.

8.5. Implement the risk-informed approach (Recommendation 8.3) to increase NRC's inspection focus on sites with "high risk" of environmental contamination concerns by:

1) Increasing inspector qualifications in hydrology, geology, etc.;

2) Increasing inspections and inspector evaluations of record keeping requirements [i.e., 10 CFR 20.1501 (Surveys and Monitoring); 10 CFR 20.2103 (Records of Surveys); 10 CFR 20.2203 (Reports of radioactive material exceeding constraints or limits)];

3) Increasing inspections and inspector evaluations of record keeping requirements of 10 CFR 40.36 and others to identify potential problems early; and

4) Modifying Manual Chapter 2600, to include performance- and risk-informed evaluations, using those in Manual Chapter 2500 as examples.

Implement in revised inspection procedures and a RIS.

POTENTIAL APPLICABILITY OF LICENSE TERMINATION RULE ISSUES TO EXISTING DECOMMISSIONING SITES (SDMP, COMPLEX, FORMERLY TERMINATED LICENSED SITES) AND FUTURE DECOMMISSIONING SITES

Existing Decommissioning Sites	**Type of Site and Contamination**		**License Termination Rule Issues (●=provides benefit; ❍=addresses general questions; na=not applicable)**								
Name, Location	Type	Nuclides	Restricted Release	Unimportant Quantities	Alt. U/TH Standard	On-site Disposal**	Control of Solid Mat.	Realistic Scenarios	Financial Assurance *	Operational Changes**	Intentional Mixing
C.E. Windsor/Windsor, CT	COM	Co-60, U	❍	❍	❍	na	❍	●	●	na	--
Salmon River/Salmon, ID	FTL	Th	❍	❍	❍	na	❍	●	fna	na	--
Jefferson Proving Ground/ Madison, IN	SDMP	DU	❍	❍	❍	na	❍	●	fna	na	--
Watertown GSA/ Watertown, MA	SDMP	U	❍	❍	❍	na	❍	●	fna	na	--
AAR Manufacturing/ Livonia. MI	SDMP, FTL	Th	●	❍	❍	na	❍	●	fna	na	--
DOW Chemical Co./Bay City, MI	SDMP	Th,Ra	❍	❍	❍	na	❍	●	●	na	--
Mich Dept. Nat. Resources/ Kawkawlin MI	SDMP	Th	❍	❍	❍	na	❍	●	fna	na	--
NWI Land Mgnt/MI	FTL	Th	❍	❍	❍	na	❍	●	fna	na	--
SCA Services/ Kawkawlin, MI	SDMP	Th	●	❍	❍	na	❍	●	●	na	--
Recommended Actions			Guidance, RIS	RIS	RIS	RIS	RIS	Guidance, RIS	Rule, Guidance, RIS	Rule, Guidance, RIS	Commission Paper

● - Recommendations could be beneficial by resolving site-specific issues, facilitating decommissioning; or minimizing the potential for future decommissioning funding shortfalls.
❍ - Recommendations address general questions of interest, but do not resolve site-specific issues.

na - Recommendations not applicable to the site. fna–fiancially not applicable because site is either not licensed, government owned, or without significant assets.

Attachment 11

SDMP: Site Decommissioning Management Plan sites; COM: Complex sites; FTL: Formerly Terminated Licensed Sites;
* For those existing decommissioning sites where the financial assurance issue is marked by the symbol ●, five of the eight recommendations apply (recommendations 7.3 to 7.7 in Attachment 10).
** Recommendations are designed to apply to operating sites to mitigate the potential for future legacy sites.

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Mallinkrodt Chem Inc/ St Louis, MO	COM	U, Th	❍	❍	❍	na	❍	●	●	na	--
C.E. Hematite/ Festus Township, MO	COM	U, Th	❍	❍	❍	na	❍	●	●	na	--
Heritage Minerals/ Lakehurst, NJ	SDMP	Th	❍	❍	❍	na	❍	●	●	na	--
Shieldalloy Metallurigal Corp/Newfield, NJ	SDMP	U, Th	●	❍	❍	na	❍	●	●	na	--
Fansteel Inc./Muskogee, OK	SDMP	U, Th	❍	❍	❍	na	❍	●	●	na	--
Kaiser Aluminum/Tulsa, OK	SDMP, FTL	Th	❍	❍	❍	na	❍	●	fna	na	--
Kerr-McGee/Cimarron, OK	SDMP	U, Tc-99	❍	❍	❍	na	❍	●	●	na	--
Kerr-McGee/Cushing, OK	SDMP	U. Th	❍	❍	❍	na	❍	●	●	na	--
BWXT Inc./Vandergrift, PA	SDMP	Am-241, Pu, U, Co-60, Cs-137	❍	❍	❍	na	❍	●	●	na	--
Recommended Actions			Guidance, RIS	RIS	RIS	RIS	RIS	Guidance, RIS	Rule, Guidance, RIS	Rule, Guidance, RIS	Commission Paper

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POTENTIAL APPLICABILITY OF LICENSE TERMINATION RULE ISSUES TO EXISTING DECOMMISSIONING SITES (SDMP, COMPLEX, FORMERLY TERMINATED LICENSED SITES) AND FUTURE DECOMMISSIONING SITES

Existing Decommissioning Sites	**Type of Site and Contamination**		**License Termination Rule Issues (●=provides benefit; ❍=addresses general questions; na=not applicable)**								
Name, Location	Type	Nuclides	Restricted Release	Unimportant Quantities	Alt. U/TH Standard	On-site Disposal**	Control of Solid Mat.	Realistic Scenarios	Financial Assurance *	Operational Changes**	Intentional Mixing
BWXT-SLDA/Vandergrift, PA	SDMP	U, DU, Am-241, Pu, Th	❍	❍	❍	na	❍	●	●	na	--
Cabot Corp./Reading, PA	SDMP	U, Th	❍	❍	❍	na	❍	●	●	na	--
Kiski Valley Water Pollution Control Authority/Vandergrift, PA	COM	U	❍	❍	❍	na	❍	●	fna	na	--
Molycorp Inc./Washington, PA	SDMP	U, Th	❍	❍	❍	na	❍	●	●	na	--
Molycorp Inc./York, PA	SDMP	U, Th	❍	❍	❍	na	❍	●	●	na	--
Permagrain Products/Media, PA	SDMP	Sr-90	❍	❍	na	na	❍	●	fna	na	--
Safety Light Corp./Bloomsburg, PA	SDMP	Ra-226, Cs-137, Sr-90, Am-241	❍	❍	na	na	❍	●	fna	na	--
Superbolt/Carnegie, PA	FTL	U	❍	❍	❍	na	❍	●	fna	na	--
Westinghouse Electric/Waltz Mill, PA	SDMP	Sr-90, CS-137	❍	❍	❍	na	❍	●	●	na	--
Recommended Actions			Guidance, RIS	RIS	RIS	RIS	RIS	Guidance, RIS	Rule, Guidance, RIS	Rule, Guidance, RIS	Commission Paper

● - Recommendations could be beneficial by resolving specific issues, facilitating decommissioning; or minimizing the potential for future decommissioning funding shortfalls.

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Name, Location	Type	Nuclides	Restricted Release	Unimportant Quantities	Alt. U/TH Standard	On-site Disposal**	Control of Solid Mat.	Realistic Scenarios	Financial Assurance *	Operational Changes**	Intentional Mixing
Whittaker Corp./Greenville, PA	SDMP	U, Th, Ra	❍	❍	❍	na	❍	●	●	na	--
Union Carbide/Lawrenceburg, TN	COM	U	❍	❍	❍	na	❍	●	fna	na	--
West Valley, NY	COM	Numerous radionuclides including: Cs-137, Sr-90, Pu, Am, U, others	●	❍	❍	na	❍	●	fna	na	--
Number of Existing Sites Benefited			4-● 26-❍	0-● 30-❍	0-● 30-❍	na	0-● 30-❍	30-● 0-❍	17-● 13-fna	na	
Future Decommissioning Sites			●	❍	❍	●	❍	●	●	●	--

● - Recommendations could be beneficial by resolving site-specific issues, facilitating decommissioning; or minimizing the potential for future decommissioning funding shortfalls.
❍ - Recommendations address general questions of interest, but do not resolve site-specific issues
na - Recommendations not applicable to the site. fna–financially not applicable because site is either not licensed, government owned, or without significant assets.
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** Recommendations are designed to apply to operating sites to mitigate the potential for future legacy sites.

MAJOR OUTCOMES OF LTR RECOMMENDATIONS WITH RESPECT TO
NRC'S FOUR PERFORMANCE GOALS

1. Maintain Safety, Protection of the Environment, and the Common Defense and Security

Provisions of the License Termination Rule (LTR) for restricted release/alternate criteria will become viable.

Viable new options for the restricted release/alternate criteria provisions of the LTR will offer greater assurance of long-term protection for future generations.

Improving the risk-informed implementation of the LTR regarding restricted release, exposure scenarios, and preventing future legacy sites will increase the attention of both U. S. Nuclear Regulatory Commission (NRC) and licensees to areas most important to safety.

2. Make NRC Activities and Decisions More Effective, Efficient, and Realistic

Improving the risk-informed implementation of the LTR for restricted release, realistic scenarios, and preventing future legacy sites will make NRC reviews and decisions more efficient.

Increasing flexibility together with capitalizing on lessons-learned while implementing the LTR regarding restricted release and exposure scenarios, will make NRC reviews and decisions more efficient and realistic.

3. Reduce Unnecessary Burden on Stakeholders

Viable new options will be available soon for restricted release/alternate criteria provisions of the LTR, so that licensees can make decommissioning decisions and plans with more confidence and avoid unnecessary and costly delays.

Clarifications of many LTR issues in a Regulatory Issue Summary and revised guidance will improve licensee understanding of LTR requirements and flexibility of implementation, which might improve licensee efficiency and reduce some of the costs related to decommissioning (i.e., remediation costs and NRC fees).

More realistic exposure scenarios could reduce the costs for decommissioning activities (e.g., dismantlement, transportation, and offsite disposal) for some licensees.

Measures to prevent future legacy sites should reduce the potential for unnecessary, large expenditures of Federal government funds to cleanup sites if licensees go bankrupt and have insufficient financial assurance.

4. Increase Public Confidence

Stakeholder confidence might be increased as a result of providing new options for restricted release/alternate criteria provisions of the LTR, that are viable, more protective over long time periods, and more consistent with approaches used by U. S. Environmental Protection Agency, some Agreement States, and recommended by National Research Council and the American Society for Testing Materials standard.

Questions about relationships between the LTR release limit and other limits will be answered and could result in better understanding about past LTR concerns, such as off-site removal of contamination after license termination with unrestricted release.

If NRC takes aggressive measures to minimize the potential for future legacy sites, sites that could result in unnecessary large expenditures of Federal funds, this could increase the public's confidence that NRC is an effective regulator.

BREAKDOWN OF RESOURCE ESTIMATES FOR
RECOMMENDED IMPLEMENTATON ACTIONS FOR THE LICENSE TERMINATION RULE ANALYSIS

An estimated resource breakdown for staff (in FTE) and contractor support (in thousands of dollars) is given below for each of the recommended implementation actions.

FTE/thousands of dollars

	FY03	FY04	FY05	FY06	FY07
Commission paper/ LTR Analysis	0.8/0				
Commission paper/mixing	0.2/0				
Rulemaking		0.3/0	1.4/150	1.3/100	0.7/50
New and revised guidance		0.3/0	1.2/0	0.7/0	0.3/0
Revised inspection guidance		0.0/0	0.2/0		
Revised enforcement guidance		0.0/0	0.2/0		
Regulatory Issue Summary		0.4/0	0.0/0		
Total	1.0/0	1.0/0	3.0/150	2.0/100	1.0/50

Note 1): F03 resource estimates only include resources already expended for this Commission paper and planned for the Commission paper on the new issue regarding intentional mixing. No other LTR work is planned in FY03 because the staff has assumed the Commission's direction in an SRM will be received by September 30, 2003.

Attachment 13

Note 2): None of the recommended LTR actions have been previously budgeted and, therefore, will be addressed in the FY05 budget development process, using the PBPM process to reallocate resources. Currently, due to the FY04 budget constraints, some of the work will not begin until FY05. The staff reallocated resources using the PBPM process to prepare the LTR Analysis and Commission paper in FY03 in response to the Commission's SRM.