

DRAFT Proposed Technical Basis
For
Prompt Remediation, Rev. 4

1. Introduction

On December 10, 2007, the Commission issued “Staff Requirements Memorandum (SRM) for SECY-07-0177, “Proposed Rule: Decommissioning Planning (10 CFR Parts 20, 30, 40, 50, 70, and 72; RIN: 3150-AH45).” In this SRM-SECY-0177, the Commission directed the staff to address “remediation of residual radioactivity during the operational phase with the objective of avoiding complex decommissioning challenges that can lead to legacy sites.” To accomplish this, the Commission instructed the staff to:

“... engage stakeholders to develop a technical basis, possible dose limits, criteria for applying the dose limits to address this matter, or alternatives to the dose limits to address the intent of this objective. The technical bases will be a precursor to a proposed rule to include requirements for licensees to remediate residual radioactive contaminated areas and thereby minimize the creation of legacy sites.”

In response to this Commission direction, the staff has developed this draft proposed technical basis document to present the staff’s preferred approach to address prompt remediation of residual radioactivity. This draft proposed technical basis discusses the existing regulatory framework, the regulatory problem, the basis for the regulatory change, the alternatives considered, backfit considerations, stakeholder interactions, and references of pertinent documents.

2. Existing Regulatory Framework

On November 7, 1994, the U. S. Nuclear Regulatory Commission (NRC) published a notice of availability (59 FR 55497) of a Branch Technical Position (BTP), "When to Remediate Inadvertent Contamination of the Terrestrial Environment", (ML093240400). As stated in the BTP, the primary actions staff expects are that the licensees implement any prepared stabilization and remediation plans, as a part of the licensees' operational program, to keep the dose impact to a level that is as low as reasonably achievable (ALARA) and document the occurrence and subsequent actions, in accordance with decommissioning recordkeeping requirements.

In addressing remediation, staff expects that when the contamination is in a restricted area, or in an unrestricted area where the radionuclides of concern do not have established remediation criteria for contaminated soil or groundwater, the licensee will describe a process to demonstrate ALARA residual contamination levels, to be evaluated by NRC staff, by considering potential doses to individuals from exposure to the contamination. However, this guidance was not widely implemented.

2.1 License Termination Rule

In 1997, the NRC promulgated Subpart E to 10 CFR Part 20, called the License Termination Rule (LTR) (62 FR 39088; July 21, 1997). This regulation establishes dose limits as the criteria for NRC license termination. The LTR also requires applicants for NRC licenses to demonstrate how facility design and procedures for operation will minimize contamination of the facility and

the environment, and facilitate eventual decommissioning. In 2003, in response to Commission direction, staff reviewed the implementation of the LTR and summarized its findings in SECY-03-0069 "Results of the License Termination Rule Analysis". In this review, staff identified potential changes to the regulatory environment to minimize the potential for legacy sites¹. The NRC staff conducted a detailed review of information about the existing complex decommissioning sites. Two specific observations from the information about these sites were: (1) they had chronic releases of radioactive material to the subsurface environment; and (2) the NRC did not recognize the extent of existing contamination until near cessation of operations, when preliminary site survey results were reviewed. Facilities that process large quantities of material, especially in liquid form, have the potential for significant environmental contamination. Experience shows that large amounts of chemical and long-lived radioactive contamination can be released to the subsurface environment over an extended period of time from these facilities. However, the doses from these releases are generally below the radiation dose limits for operational facilities in 10 CFR Part 20 that would initiate regulatory action. Additionally, the cost to dispose of radioactive material, even with relatively low concentrations, can be very high due to limited disposal capacity. Therefore, staff identified potential changes to the regulatory environment to minimize the potential for legacy sites and made recommendations, including rulemaking. One recommendation was to strengthen certain aspects of financial assurance to better ensure availability of decommissioning funds, especially in case of financial duress of a licensee. Another recommendation was a rulemaking to require additional operational activities to identify, control, and document radioactive contamination throughout the site, especially in the subsurface. Upon approval by the Commission, the staff initiated the Decommissioning Planning Rule (DPR).

¹ A legacy site is one at which the licensee is unable to complete decommissioning because of technical or financial issues.

2.2 Decommissioning Planning Rule

The staff developed the DPR to extend the minimization of contamination requirement of the LTR to operating licensees and strengthen some financial assurance requirements. Specifically, with the addition of new § 20.1406(c) and revised § 20.1501(a), the DPR requires licensees to minimize the introduction of residual radioactivity into the site, and to perform surveys to determine the extent of contamination throughout the facility, including in the subsurface. The addition of new § 20.1501(b) requires licensees to document surveys of contamination that would require remediation at the time of license termination to meet the release for unrestricted use criteria of § 20.1402. As a result, licensees must be able to demonstrate their knowledge of significant residual radioactivity in the subsurface, including soil and groundwater contamination, particularly if the subsurface contamination is a significant amount that would require remediation during decommissioning to meet the unrestricted use criteria.

Several changes were also made to the financial requirements. One new requirement reflects the proposed changes being made to the § 20.1501(a) survey requirements. If these surveys detect residual radioactivity at a site at levels that would, if left uncorrected, prevent the site from meeting the § 20.1402 criteria for unrestricted use, non-power reactor licensees must submit a revised decommissioning funding plan (DFP) within one year of when the survey is complete. Each DFP submitted for review and approval must contain a decommissioning cost estimate (DCE) based on three cost components. Two of the cost components, a dollar amount adequate to cover the cost of an independent contractor to perform all decommissioning

activities, and an adequate contingency factor, are described in existing guidance. The newly added third cost component is an estimate of the volume of onsite subsurface material containing residual radioactivity that will require remediation to meet the decommissioning criteria. Additionally, the DCE must be based on the cost of meeting the § 20.1402 criteria for unrestricted use unless the licensee obtains NRC approval and demonstrates it meets all of the requirements of § 20.1403. Another new provision requires the licensee to identify and justify the basis for all key assumptions underlying the DCE.

On June 17, 2011, NRC promulgated the final DPR (76 FR 35512), that requires licensees to conduct radiological surveys at the site, including the subsurface, to identify the extent and concentrations of radioactive contamination. If these surveys identify contamination that would require remediation to meet criteria for releasing the area for unrestricted use at the time of license termination, the licensee is required to enter the results into records important to decommissioning. It also requires licensees to estimate the cost to remediate the contamination. The NRC provides implementation guidance for the rule in DG-4014 and NUREG-1757, Vol. 3, Rev. 1.

Within the SRM that approved the proposed DPR (SRM-SECY-07-0177; December, 2007), the Commission addressed the issue of prompt remediation. Specifically, the Commission directed the staff to:

“... make further improvements to the decommissioning planning process by addressing remediation of residual radioactivity during the operational phase with the objective of avoiding complex decommissioning challenges that can lead to

legacy sites.... [and] engage stakeholders to develop a technical basis, possible dose limits, criteria for applying the dose limits to address this matter, or alternatives to the dose limits to address the intent of this objective.”

To respond to Commission direction, the staff developed this draft proposed technical basis to facilitate discussion with stakeholders in developing a technical basis document as a precursor to a proposed rule.

3. Regulatory Issue

While the DPR does require licensees to identify the extent of radiological contamination at the site, it does **not** require any action to conduct remediation during the operational phase of plant life, regardless of the concentration or physical extent of the contamination. Staff experience in the decommissioning of nearly 100 sites demonstrates that un-remediated contamination, especially in the subsurface, can, over time, migrate and contaminate large volumes of the surrounding area and resources. This directly results in sizeable increases in the remediation and survey costs to meet license termination criteria, and has the potential to result in additional legacy sites.

The DPR also suggests, but does not compel, that licensees conduct remediation sooner rather than wait for license termination. During the time between discovery and license termination, the contamination has the potential to spread to significantly larger volumes of surrounding media. The staff believes that it is important for licensees to consider the need for prompt remediation in order to avoid future problems resulting from delayed cleanup of contaminated

facilities (e.g., increased decommissioning costs, and dose impacts). In addition, when licensees delay remediation until decommissioning, safety practices may be relaxed as operating hazards decrease, key personnel relocate and management focus changes. In addition, bankruptcy, corporate takeover, or other unforeseen changes in the company's financial status may complicate and perhaps further delay remediation. As a result, the NRC staff has explored policy options to require licensees to promptly remediate contamination when certain criteria are triggered.

4. Proposed Preferred Approach

4.1 General Description

As discussed in Section 3, there are currently no NRC regulations that require licensees to promptly remediate radiological contamination during operations, regardless of the volume or contaminant concentration levels.

Therefore, the NRC's preferred approach to address this regulatory issue is a rulemaking to require licensees to promptly remediate radioactive spills and leaks when concentrations exceed certain threshold limits. NRC's preferred approach contemplates using the NRC screening values for soil and the U.S. Environmental Protection Agency (EPA) maximum contamination levels (MCLs) for groundwater as the threshold limits. The preferred approach would also include a provision allowing licensees to delay remediation when the site meets certain conditions. To justify a delayed remediation, licensees would be required to perform analyses such as dose assessment, risk assessment and/or cost-benefit analyses for the NRC's

review. The parameters that NRC anticipates to be considered in the analyses include, but are not limited to, ALARA (as low as reasonably achievable) considerations, the cost of remediation at the time of decommissioning, and what actions are in the best interest of the public.

Additionally, NRC will emphasize that it is prudent to perform sampling and monitoring efforts early on and regularly after a leak or spill is discovered.

4.2 Preferred Approach – The Required Analyses

As part of the preferred regulatory approach, the NRC staff plans to identify constituent concentration limits that, when detected, will trigger a requirement for licensees to conduct analyses in order to justify delaying or not remediating. Relevant threshold concentrations may differ for soil versus groundwater. For example, licensees may use NRC screening values² for soil and EPA's MCLs for drinking water for groundwater³; licensees may also perform site-specific dose analyses.

Under the NRC staff's preferred approach, if the contamination meets the threshold concentrations, and therefore triggers an analysis to justify delayed remediation, the licensee would perform a dose analysis, risk assessment, cost-benefit or other analyses to justify a delayed remediation. The NRC staff envisions these analyses as assessing a variety of factors. For example, the analysis would include the following factors, among others: (1) risk to human health and safety, (2) facility operational safety; (3) contaminant characteristics, and (4) cost.

The analysis addressing the risk to human health and safety could include criteria for assessing

² NUREG-1757 Volume 2, Appendix H

³ On October 9, 2002, the NRC and EPA entered into a Memorandum of Understanding (MOU) to establish the framework and working relationships to be used in the radiological decommissioning and decontamination of NRC-licensed sites (ML022830208). In the MOU, the NRC agrees to consult EPA on the appropriate approach in responding to sites with ground-water contamination in excess of EPA's MCLs.

the risk associated with spills or newly identified contamination found on a site. Examples of such criteria are listed below. The results of this analysis would identify serious situations that could require prompt remediation, and less serious situations in which delayed remediation may be justified.

Lower hazard sites:

- Shorter hazard duration: shorter dose persistence or shorter radionuclide half-life.
- Lower hazard level: calculated dose is less than an established public dose limit.

Higher hazard sites:

- Longer hazard duration: longer dose persistence or longer radionuclide half-life.
- Higher hazard level: calculated dose is greater than an established public dose limit.

A second factor that licensees would need to consider would be the potential impacts on facility operational safety by remedial activities. The licensee would need to assess the likelihood of disrupting normal operations and potential effects on operations by digging or other activities related to remediating subsurface contamination.

A third factor that licensees would need to evaluate, as part of their analyses, would be contaminant quantity and potential effects. Depending on the facility, there could be a spectrum of potential contaminants in a spill or leak. The licensee would need to assess both the overall effects and the quantity of the contaminant(s) present to determine if prompt remediation is justified.

A fourth factor that licensees would need to evaluate, as part of their analyses, would be the cost of remediation. To evaluate the cost-effectiveness of prompt remediation, the licensee could compare the cost of a future cleanup to the cost of an immediate cleanup, with the lower value deemed to be more cost-effective. If non-routine activities are necessary to maintain plant safety during prompt remediation, these costs should be included in the calculation. Licensees would need to determine the cost of prompt cleanup, the cost of the future cleanup, an interest rate to represent the weighted average cost of borrowing for the licensee, and the number of years in the future when the cleanup will occur.

These examples do not encompass all of the factors that affect the decision to promptly remediate contamination at a site. As the NRC staff further develops the rulemaking and associated implementation guidance, the factors that should be analyzed and evaluated by the licensees will be specified. In addition, the NRC staff will solicit public comment on this topic, as discussed in Section 7.

4.3 Preferred Approach – Expected Outcomes

The consequences of this rulemaking approach include potential benefits to public health and safety and the environment. In addition, the NRC's preferred approach likely would result in enhanced administrative and regulatory effectiveness of the NRC, the regulatory authorities in the Agreement States, and the affected licensees. Expected benefits may accrue in the following areas:

- 1) decreased risk of potential for additional legacy sites;
- 2) decreased risk to the public health and safety resulting from the exposure to ionizing radiation caused by serious events or other inadvertent spread of contamination;
- 3) decreased risk to the health and safety of occupational workers resulting from reduced likelihood of inadvertent exposure to ionizing radiation in areas with radioactive materials spills or other contamination;
- 4) improved public trust and confidence; and
- 5) improvements in regulatory and administrative efficiency;
- 6) potential cost savings from early remediation and disposal.

Impacts of the rulemaking include possible additional costs to affected licensees and the NRC.

The following expected costs may be incurred:

- 1) implementation costs to licensees (e.g., one-time costs to change policies and procedures);
- 2) implementation costs to the NRC (e.g., one-time costs to promulgate rulemaking, develop implementation guidance, Standard Review Plans, and other internal procedures);
- 3) operational costs to licensees (e.g., costs to conduct analyses when contaminant thresholds are met); and,
- 4) operational costs to the NRC (e.g., costs to review analyses conducted by licensees).

The regulations would clearly delineate the licensee's responsibility to pursue timely remediation in the event of significant leaks and spills. The rule language would define the basis for

determining whether a leak or spill is significant. In addition, the proposed rule would place a limit on the time permitted to remediate and place the burden of proof directly on the licensee to demonstrate that a longer time is required for completing remediation.

The time requirements for completing remediation include the times for initiating the remediation process. In determining an appropriate requirement for initiating remediation, the following will be considered: (1) the benefit in terms of reduced worker dose and reduced volume of decontamination wastes produced which may be realized by delaying decontamination to await decay of short-lived radionuclides; and (2) determining the appropriate time requirements for the completion of subsequent decommissioning-related activities, including the time needed to plan and safely carry out remediation.

5. Alternatives to Rulemaking Considered

Staff considered the following as an alternative to the preferred approach of requiring licensees to justify a schedule for remediation during operations:

- Require licensees to promptly remediate radioactive spills and leaks when certain conditions are met. These conditions may include a threshold for the calculated dose to the public associated with the contamination event, such as the restricted release level of 10 CFR 20.1403. Prompt remediation is a logical extension of §§ 20.1406(c) and 20.1501(a) because the proposed assessment represents a “next step” for cases where the contamination presents a potential radiological hazard. However, dose is a calculated value that is a function not only of the concentration and mix of isotopes

present, but also of the location of the receptor, the time and duration of exposure, and the exposure pathway(s). Therefore, this alternative introduces a level of complexity that is neither necessary nor desirable for each spill or leak.

- Issuing a regulation that will require licensees to conduct prompt remediation of a spill or leak when concentrations exceed certain contaminant thresholds in order to avoid a potential legacy site. Unlike the preferred approach, this alternative would not provide the licensee with the opportunity to conduct an analysis to justify a delayed or no remediation. For this alternative, the NRC would consider a new regulation or enhancements to one of two regulatory requirements that were revised under the final DPR:

- Section 20.1406(c), which requires licensees to operate their facilities in a manner that minimizes the introduction of radioactive waste into the site, including the subsurface, in order to achieve effective decommissioning planning and to facilitate remediating the site for unrestricted use at the time of license termination; or
- Section 20.1501(a), which requires licensees to conduct surveys to determine concentrations or quantities of residual radioactivity and potential radiological hazards during both operations and decommissioning.

Other alternatives that staff considered and did not pursue are:

- Issuing site-specific license conditions following identification of contamination above some specified volume and concentration. Staff did not pursue this alternative because it is not directly responsive to the SRM. This approach could result in inconsistencies in remediation actions, and it would create a regulatory burden.
- Revising DG-4014/RG-4.22 to include guidance on complying with a requirement to conduct prompt remediation. Staff did not pursue this alternative because the regulatory basis for the DPR states that the new rules do not require prompt remediation. Implementation guidance cannot impose new requirements on licensees. Therefore, this alternative is not viable.
- Issuing new guidance in the form of a NUREG. Staff did not pursue this alternative because NUREG documents represent staff opinion and again guidance cannot impose new requirements on licensees. This approach would not be fully responsive to the intent of the SRM.
- No Action. Under this alternative, the NRC staff would rely on existing regulations and guidance documents to encourage licensees to consider prompt remediation after spills or leaks. This alternative also would not be fully responsive to the intent of the SRM.

6. Backfit Considerations

When the draft rule language is fully developed, the staff will determine whether it would satisfy the backfit regulations at 10 CFR 70.76, 10 CFR 72.62, and 10 CFR 76.76 for materials facilities or 10 CFR 50.109, 10 CFR 52.39, and 10 CFR 52.63 for power reactors.

7. Stakeholder Interactions

Staff plans to conduct a Category 2 public meeting in July 2011, to obtain input from a wide range of stakeholders on the proposed approach. The staff will request feedback on the draft proposed technical basis, staff's preferred approach, and the potential criteria that could be used to compel licensee to take actions.

Early public participation is a key to success. In addition to the general public, other stakeholders may include representatives of licensee and trade organizations, Federal agencies, state regulators, and interested non-governmental organizations (NGOs). . The NRC staff has identified stakeholders with keen interest in the issue of prompt remediation. For example, in addition to the NRC staff, there are other federal and state regulators, such as EPA and state departments of environment and health, which have important roles to play when licensees detect residual radioactivity. Another stakeholder group includes the range of potentially affected licensees of both the NRC and the Agreement States.

In order to solicit the stakeholders' input to inform the NRC's decision on how to implement the requirements of the SRM, staff will hold a public meeting. Participants will include stakeholders

representing the broad spectrum of interests who may be affected by the outcome of the draft proposed technical basis. Opportunities will be provided for comments and questions from the general public. Participants will be asked to comment specifically on the preferred approach that the NRC has identified and propose any alternatives they believe should be included to implement the SRM. They also will be asked to comment on the required analyses proposed by the NRC and provide suggestions on how to improve the NRC's preferred approach. This information will be included in the meeting notice that will be issued prior to the public meeting. A *Federal Register* Notice will also be published to announce the public meeting and to further solicit comments and inputs on the draft proposed technical basis.

8. References and Pertinent Documents

Branch Technical Position "When to Remediate Inadvertent Contamination of the Terrestrial Environment," October 1994. (ML093240400)

SRM-SECY-07-0177, "Staff Requirements – SECY-07-0177 – Proposed Rule: Decommissioning Planning (10 CFR Parts 20, 30, 40, 50, 70, and 72; RIN: 3150-AH45)," December 10, 2007. (ML073440549)

SECY-07-0177, "Proposed Rule: Decommissioning Planning (10 CFR Parts 20, 30, 40, 50, 70, and 72; RIN: 3150-AH45)," October 3, 2007. (ML072390153)

Final Rule: Revisions to 10 CFR Parts 20, 30, 40, 50, 70, and 72, Decommissioning Planning, 76 *FR* 35512, June 10, 2011. (ML103510117)

Draft Regulatory Guide DG-4014, "Decommissioning Planning During Operations," July 2011.
(ML111590642)

NUREG-1757, Volume 3, Revision 1, "Consolidated NMSS Decommissioning Guidance,"
September 2011. (tbd)

SECY-11-0019, "Senior Management Review Of Overall Regulatory Approach to Groundwater
Protection," February 9, 2011. (ML110050525)

PRE-DECISIONAL