



# DRAFT REGULATORY GUIDE

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## DRAFT REGULATORY GUIDE DG-4014 (Proposed New Regulatory Guide)

### DECOMMISSIONING PLANNING DURING OPERATIONS

#### A. INTRODUCTION

##### Purpose

This guide describes a method acceptable to the U.S. Nuclear Regulatory Commission (NRC) for use in implementing the Decommissioning Planning Rule (DPR) that revises Title 10, Section 20.1406, “Minimization of Contamination,” and Section 20.1501, “Surveys and Monitoring, General,” of the *Code of Federal Regulations* (10 CFR 20.1406 and 20.1501) (Ref. 1). Licensees of operating facilities are required to minimize contamination and radioactive waste generation, conduct appropriate radiological surveys, and maintain records. The DPR revisions to 10 CFR 20.1406 and 10 CFR 20.1501 apply during the operational phase of facilities’ life cycles.

##### Background

In 1997, the NRC issued Subpart E, “Radiological Criteria for License Termination,” to 10 CFR Part 20, “Standards for Protection Against Radiation” (Ref. 1), known as the “License Termination Rule.” At that time, 10 CFR 20.1406 of the LTR required license applicants to describe in their applications how the design and procedures for operation of new facilities would minimize contamination and facilitate decommissioning. This requirement is an inherent, integral part of the requirements for any 10 CFR 20.1101 Radiation Protection Program.

Guidance on implementing the minimization of contamination provisions of the 1997 LTR appears in Regulatory Guide (RG) 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning” (Ref. 2), that states, in part: “[T]he development of a contaminant

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This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received final staff review or approval and does not represent an official NRC final staff position. Public comments are being solicited on this draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; submitted through the NRC’s interactive rulemaking Web page at <http://www.nrc.gov>; or faxed to (301) 492-3446. Copies of comments received may be examined at the NRC’s Public Document Room, 11555 Rockville Pike, Rockville, MD. Comments will be most helpful if received by February 10, 2012.

Electronic copies of this draft regulatory guide are available through the NRC’s interactive rulemaking Web page (see above); the NRC’s public Web site under Draft Regulatory Guides in the Regulatory Guides document collection of the NRC Library at <http://www.nrc.gov/reading-rm/doc-collections/>; and the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>, under Accession No. ML111590642. The regulatory analysis may be found in ADAMS under Accession No. ML111590649.

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management philosophy... requires the use of...conservative radiation protection principles, and attention to operational practices.”

At the direction of the Commission, the NRC staff reviewed implementation of the LTR and developed several recommendations for revisions (Ref. 3). In its response to the staff recommendations, the Commission authorized the staff to develop rules (Ref. 4) to minimize the likelihood of new “legacy sites” — those sites with insufficient resources to complete decommissioning and terminate the license at the end of operations. On June 17, 2011, the NRC promulgated the DPR (Ref. 5). The DPR requires all licensees to establish operational practices to minimize contamination and perform subsurface radiological surveys, and sets forth new financial assurance requirements.

### **Relationship between RG 4.21 and RG 4.22**

RG 4.21 provides guidance to applicants on implementing the requirements of 10 CFR 20.1406 to design facilities and develop operational procedures to minimize radioactive waste generation and facility contamination. That is, RG-4.21 is directed primarily at the design and construction phase of the facility life cycle. The guidance consists of specific design considerations drawn from nuclear industry experience and lessons learned from decommissioning. These are combined in a threefold contaminant management philosophy: (1) prevention of unintended releases; (2) early detection, if there is unintended release of radioactive contamination; and (3) prompt assessment to support a timely and appropriate response.

This regulatory guide (RG 4.22) provides guidance for operating facilities on methods of meeting regulatory requirements for effective decommissioning planning. This guidance provides methods for determining if changes to operations or monitoring programs are needed to comply with 10 CFR 20.1406(c) or 20.1501. The guidance also describes survey methods suitable to identify impacted areas and to estimate the approximate volume of radiological contamination that may have to be remediated at the time of license termination, and will help to determine whether existing financial assurance provided for site-specific decommissioning is adequate.

### **Requirements**

The DPR requires licensees to minimize the introduction of significant residual radioactivity into the site and to perform radiological surveys to identify the extent of contamination at their sites, including the subsurface, that are reasonable under the circumstances to evaluate concentrations or quantities of residual radioactivity. The term “residual radioactivity” is defined in 10 CFR 20.1003, “Definitions,” as radioactivity in structures, materials, soils, groundwater, and any other media at a site resulting from activities under the licensee’s control. “Significant” residual radioactivity is characterized in the DPR as “a quantity of radioactive material that would later require remediation during decommissioning to meet the unrestricted use criteria of 10 CFR 20.1402.”

The DPR broadens and clarifies the 1997 LTR as follows:

1. It extends from applicants to licensees the requirements for operations to be conducted in a manner to minimize contamination, but does not mandate any design changes to operating facilities;
2. It explicitly includes the subsurface in the radiological surveys required of all licensees by 10 CFR 20.1501(a);
3. It establishes a threshold for when residual radioactivity becomes “significant” residual radioactivity; and

4. It requires all licensees to retain 10 CFR 20.1501(a) survey results with records important to decommissioning (it does not require licensees to submit reports of survey results).

Although the DPR does require subsurface surveys, it does not require the extensive site characterization and compliance surveys that are required by decommissioning regulations and defined in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," Revision 1, issued August 2000 (Ref. 6). Further, it does not set decommissioning criteria, nor does it mandate any remedial activities of onsite or offsite residual radioactivity during operations.

The DPR does not require licensees to conduct complex, detailed site surveys. Rather, the DPR does require licensees to conduct scoping surveys to identify the extent of significant residual radioactivity. For nuclear power plants, existing radiological environmental monitoring programs and subsurface (ground water) monitoring conducted by implementation of the Nuclear Energy Institute's (NEI's) Ground Water Protection Initiative (Ref. 7) is generally considered adequate to meet the DPR. However, the DPR does require that the results of the monitoring and surveys be included in records important to decommissioning.

Neither the DPR nor this regulatory guide defines a specific number of monitoring, surveying, or sampling events to comply with the new requirements. Because of the wide diversity of licensee facilities and processes and the equally wide variation in site conditions, each licensee must develop its own site specific surveillance and monitoring plan and procedures for:

1. Demonstrating that the facility is being operated in a manner that minimizes the introduction of radiological contamination into the environment.
2. Performing surveys sufficient to determine the extent of significant residual radioactivity contamination in the site environment.
3. Periodically evaluating the costs to remediate significant residual radioactivity to unrestricted release levels at the time of license termination. Changes to financial assurance regulations require licensees to include the results of this evaluation in required decommissioning cost and financial assurance updates. The DPR also requires licensees, other than power reactors, to arrange for adequate decommissioning funds by the time of license termination to remediate significant residual radioactivity to the criteria of 10 CFR 20.1402, "Radiological Criteria for Unrestricted Use."

## **Harmonization with International Standards**

The following IAEA Safety Standards and Guides provide useful information on nuclear facility safety and their principles have been incorporated into this guide: SSG-5, "Safety of Conversion Facilities and Uranium Enrichment Facilities," SSG-6, "Safety of Uranium Fuel Fabrication Facilities," NS-G-4.6, "Radiation Protection and Radioactive Waste Management in the Design and Operation of Research Reactors," NS-R-5, "Safety of Nuclear Fuel Cycle Facilities," and WS-G-3.1, "Remediation Process For Areas Affected By Past Activities And Accidents." The difference between this guide and the IAEA Safety Standards and Guides is that the latter are generic in nature whereas this guide provides direct linkage to NRC regulations.

## **Scope**

Organization of Agreement States and NRC licenses cover many different kinds of activities that reflect widely varying potential for contamination of a facility and the environment and for the generation of radioactive waste. Therefore, although this guide applies to all types of facilities, it recognizes that there is a wide range of potential contamination sources and facility conditions and so provides a risk-

informed approach to implementing the DPR. The risk-informed approach to implement the DPR recognizes the need for minimizing contamination to the extent practical while at the same time not requiring definitive identification and quantification of all residual radioactivity.

Existing 10 CFR 20.1401(a) specifically excludes uranium recovery facilities from the scope of Subpart E to 10 CFR Part 20. The DPR does not change the exclusion, therefore uranium recovery licensees are not subject to the new DPR requirements in Subpart E.

This regulatory guide does not address the details of revisions to financial assurance requirements in the DPR. That guidance is presented in NUREG-1757, Volume 3, “Financial Assurance, Recordkeeping, and Timeliness,” Revision 1 (Ref. 8).

The NRC issues regulatory guides to describe to the public methods that the staff considers acceptable for use in implementing specific parts of the agency’s regulations, to explain techniques that the staff uses in evaluating specific problems or postulated accidents, and to provide guidance to applicants. Regulatory guides are not substitutes for regulations and compliance with them is not required.

This regulatory guide contains information collection requirements covered by 10 CFR Part 20 that the Office of Management and Budget (OMB) approved under OMB control number 3150-0014. The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number. This regulatory guide is a rule as designated in the Congressional Review Act (5 U.S.C. 801–808). However, OMB has not found it to be a major rule as designated in the Congressional Review Act.

## **B. DISCUSSION**

The DPR adds a new paragraph, 10 CFR 20.1406(c), which establishes a new requirement for licensees with operating licenses to operate their facilities in a manner that minimizes the introduction of residual radioactivity into the site, including the subsurface, to facilitate remediation of the site for unrestricted use at the time of license termination.

The DPR also amends 10 CFR 20.1501(a) to explicitly include a requirement for radiological surveys in the subsurface necessary to evaluate residual radioactivity at licensed sites. This revised regulation retains its existing limit of “reasonable under the circumstances.” The term “residual radioactivity” is defined in 10 CFR 20.1003, “Definitions,” as any radioactivity from licensed and unlicensed sources that has been introduced to the site by activities under the licensee’s control. In the Statements of Consideration for the rule, a “significant amount of residual radioactivity” is defined as an amount that would require remediation during decommissioning to meet the unrestricted use criteria specified in 10 CFR 20.1402. Significant residual radioactivity in subsurface media, such as soil, is an important component of waste because, after operations cease, it must be removed and disposed off site to meet unrestricted use criteria.

The new 10 CFR 20.1501(b) requires licensees to keep records of the required surveys describing the locations and amounts of residual radioactivity identified at the site with other records important to decommissioning. It does not require licensees to submit reports of survey results.

The NRC’s technical basis for identifying the effect that significant residual radioactivity has on decommissioning costs is a 2005 NRC staff study (Ref. 9). The purpose of the study was to compile and evaluate experience at sites undergoing decommissioning to identify the types of events that have caused

subsurface contamination. Evaluating these events provided a means for NRC staff to identify the potential for future subsurface contamination at currently operating facilities. The study identified a number of events that could increase decommissioning costs by increasing the possibility of significant soil or ground water contamination and concluded that these events should cause the licensee to reevaluate its decommissioning cost estimate. In particular, slow and long-lasting leaks of radioactive material into the subsurface may eventually produce radiological hazards and significantly increase the cost of decommissioning. The study concluded that the sites with a higher likelihood of becoming legacy sites shared the following characteristics:

1. relatively large volumes of low specific activity radioactively contaminated liquids;
2. large volumes of long-lived radionuclides;
3. large throughput;
4. liquid processes; or
5. processes that involve large quantities of solid radioactive material stored outdoors.

Decommissioning regulations require licensees to remediate sites to approved release criteria for unrestricted use (unless they can demonstrate the need for restricted use) without regard to the cost. Early detection of significant subsurface contamination through surveys and monitoring and appropriate response by the licensee is the preferred approach because the regulatory objective is to ensure the licensee and the NRC are aware of contamination that may create conditions that would complicate decommissioning, and possibly create a legacy site. Therefore, essential parts of decommissioning planning are early identification of significant residual radioactivity, estimating the total cost of remediation, and financial planning to ensure that funds are available when needed.

This regulatory guide provides a risk-informed, graded approach to implementing the regulation. The risk-informed approach to implementing this rule is illustrated in Figures 1–3. A more detailed discussion of each block of the figures is in Appendix A to this guide.

Figure 1 illustrates the questions to determine if a licensee needs to do anything because of the DPR. As stated above, uranium recovery licensees are exempt from all requirements of this rule. Staff has reviewed NEI’s Ground Water Protection Initiative (GPI) and compared it to the DPR requirements. Based on this review, staff concludes that Objective 1.1, characterize site geology and hydrogeology, Objective 1.2, identify system, components and work practices that have the capability to release contamination to the ground water, and Objective 1.3, establish an on-site ground water monitoring program to ensure timely detection of unplanned radiological releases to ground water, of the GPI establish a satisfactory framework for licensees to institute an effective ground water monitoring program as required by 10 CFR 20.1501(a). GPI Objective 1.4, establish a protocol to prevent off-site migration and minimize decommissioning impacts, provides an acceptable approach to the requirements of 10 CFR 20.1406(c). GPI Objective 1.5, ensure records of leaks and spills are retained in accordance with 10 CFR 50.75(g), is consistent with the recordkeeping requirements of 10 CFR 20.1501(b). Therefore, nuclear power plant licensees that have implemented NEI’s GPI are considered to have an adequate subsurface monitoring program as part of meeting the requirements of 10 CFR 20.1501(a), and a recordkeeping system in accordance with 10 CFR 20.1501(b). NRC reviewed Topical Report NEI 08-08, “Generic Final Safety Analysis Report Template Guidance for Life-Cycle Minimization of Contamination,” Revision 3. As documented in a letter to NEI dated October 19, 2009 (ADAMS Accession No. ML092720253), “The NRC staff finds that for combined license (COL) applications, NEI 08-08, Revision 3, provides an acceptable template for an operational program to minimize contamination throughout the life-cycle of a facility which meets applicable NRC regulations and guidance....” Sections 2 and 4.3 of NEI-08-08 specify that applicants for combined construction and operating licenses should implement the GPI prior to fuel loading. The DPR does not make any further requirements of these licensees. If a licensee is not either of these types, proceed to Figure 2.

Figure 1 Does the DPR affect me?

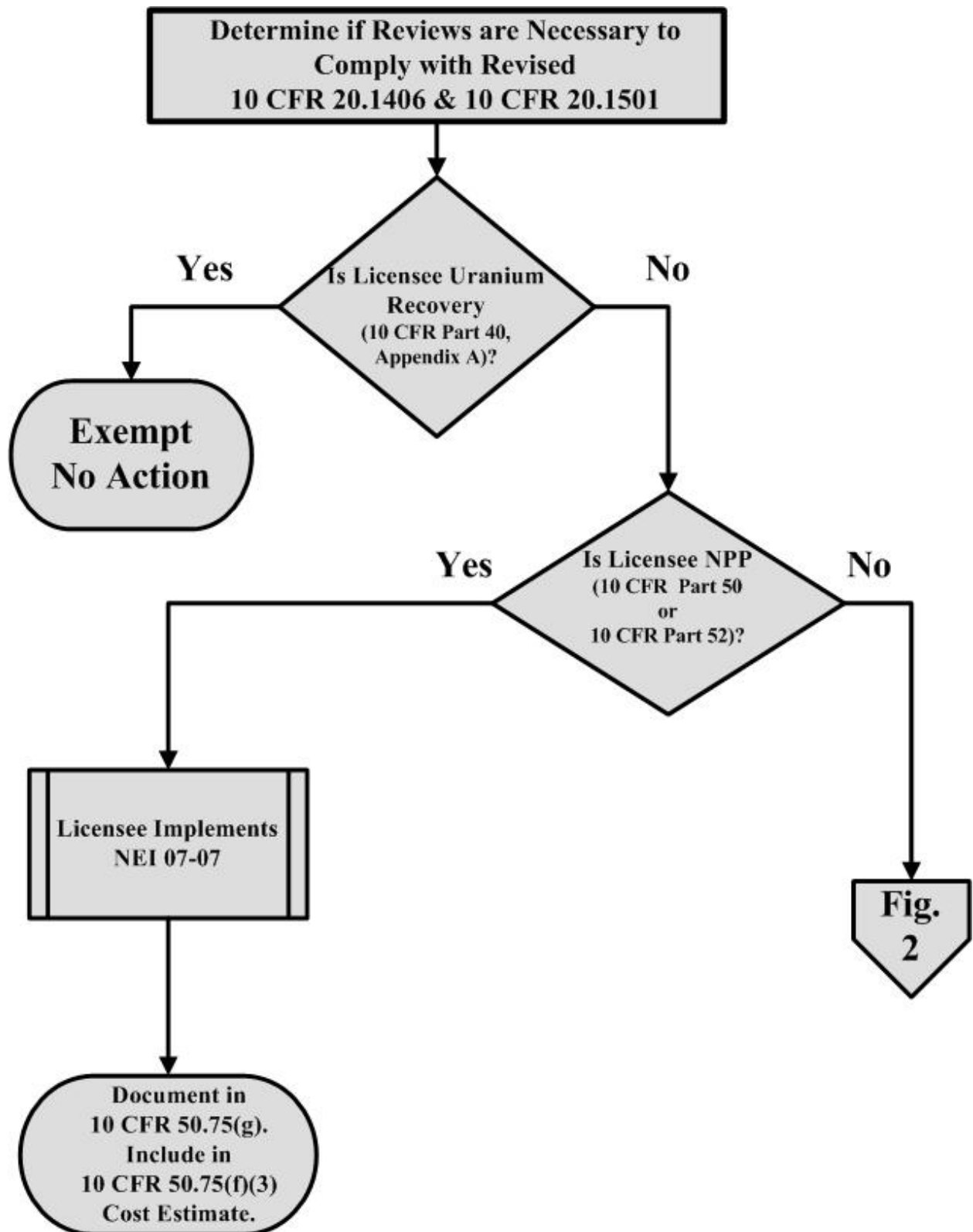


Figure 2 identifies additional questions for other licensees to use to determine whether the DPR requires them to perform any actions. The first question is whether the licensee is authorized to possess enough radioactive material to potentially create a decommissioning obligation. If the possession limit in the license is below the levels requiring financial assurance specified in 10 CFR 30.35(d), 40.36(b), or 70.25(d), then no further action is required by the DPR. Any licensee that is required to provide financial assurance must determine if there have been previous spills or leaks during the operating history of the site. Also, the licensee must identify the potential for such events to occur in the future. Therefore, if fluids – liquids, gases, aerosols – are part of the operations at the site, licensees should conduct a more detailed review of monitoring and survey plans to ensure identification of the sources and extent of future leaks or spills. The DPR does not mandate any design changes to the physical facility. Considerations for revisions to procedures are in Figure 3.

Figure 2 Does the DPR really require me to do something?

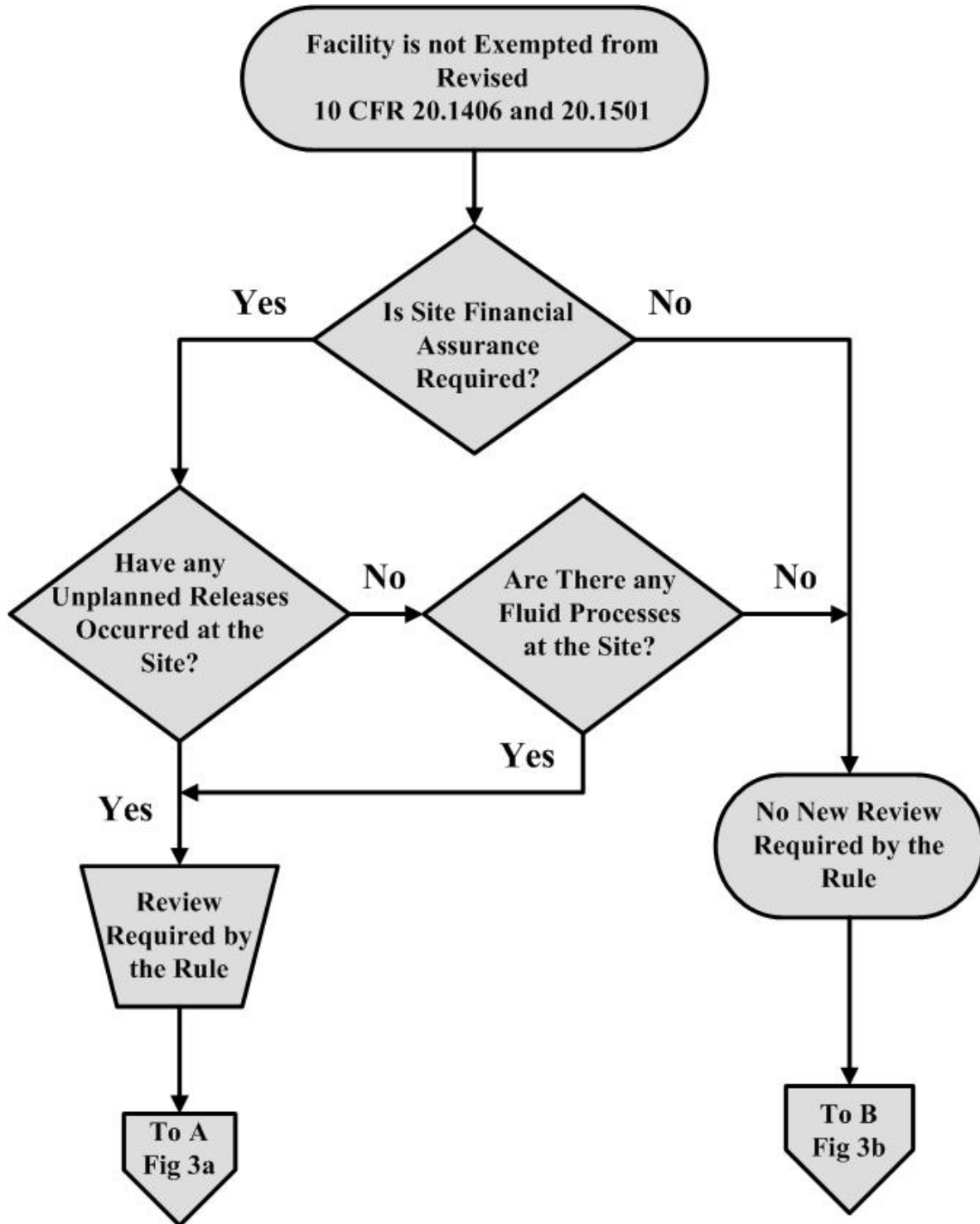




Figure 3a illustrates specific areas for consideration as part of a licensee's review of monitoring and surveillance plans. They include (1) unmonitored areas inside buildings or outside where spills or leaks could occur, and (2) unmonitored areas onsite where effluents might concentrate. For materials licensees this may include such things as dispersible powders or aerosols.

Note that some of these areas, where significant residual radioactivity may be present, may not be readily accessible for conducting direct surveys because of the physical layout of systems and structures. If the licensee identifies areas that cannot be reasonably surveyed directly, it should establish surrogate monitoring (e.g., sentinel monitoring locations) on a schedule commensurate with the likelihood of significant residual radioactivity occurring there.

For many licensees, survey and monitoring requirements may be established by either license conditions or in documents specifically referenced in the license. Therefore, changes to these plans may require approval by the NRC. If so, licensees should obtain NRC approval, to the extent necessary, with revisions to these plans.

Figure 3b shows the actions that licensees should normally follow in implementing survey and monitoring plans. Once the cause of the contamination is identified, licensees should take corrective action to minimize further contamination. If significant residual radioactivity is not expected to remain at the time of license termination, no additional actions are required by the DPR. If significant residual radioactivity is expected at the time of license termination, licensees should estimate the financial impact and consider timely remediation. Licensees should judiciously monitor the area until concentrations are decreasing to ensure that the corrective action has been effective.

The revised 10 CFR 20.1501(b) also requires licensees to record, in records important to decommissioning, the amounts and locations of subsurface residual radioactivity that may need remediation at the time of license termination. These records provide important input to the historical site assessment.

At 10 CFR 30.35(e), 40.36(d), 70.25(e), and 72.30(b), the DPR also requires licensees to adjust decommissioning funding as appropriate to the license type. Nuclear power plant licensees should include the effect of survey results in the decommissioning cost estimates required by 10 CFR 50.75(f)(3) and 10 CFR 50.82(a)(8)(iii). Other licensees should adjust decommissioning trust funds to reflect the necessary remediation to meet unrestricted use criteria at the time of license termination. See NUREG-1757, Volume 3, Revision 1, for additional information (Ref. 8).

**Figure 3a What does the DPR require me to do?**

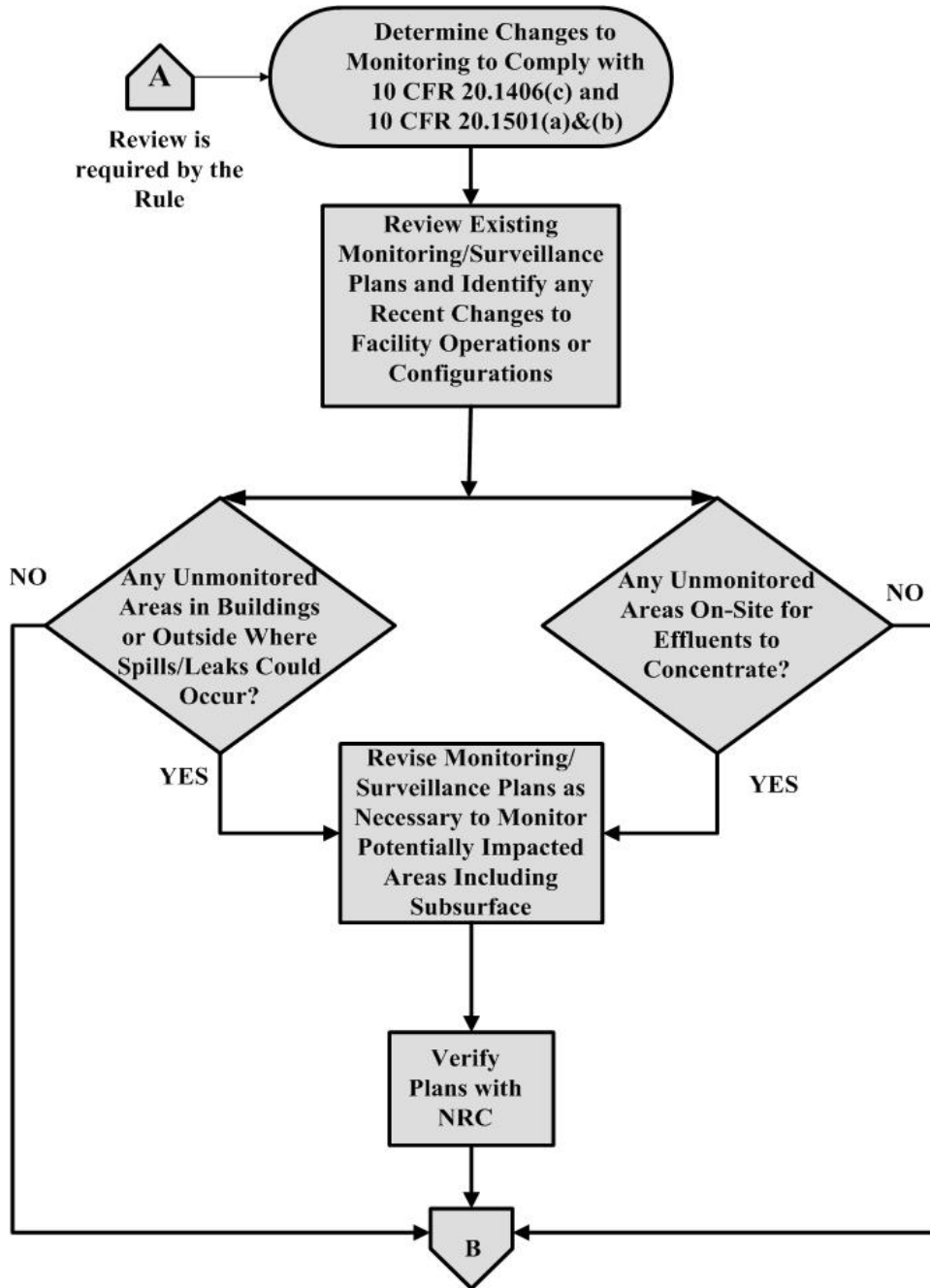
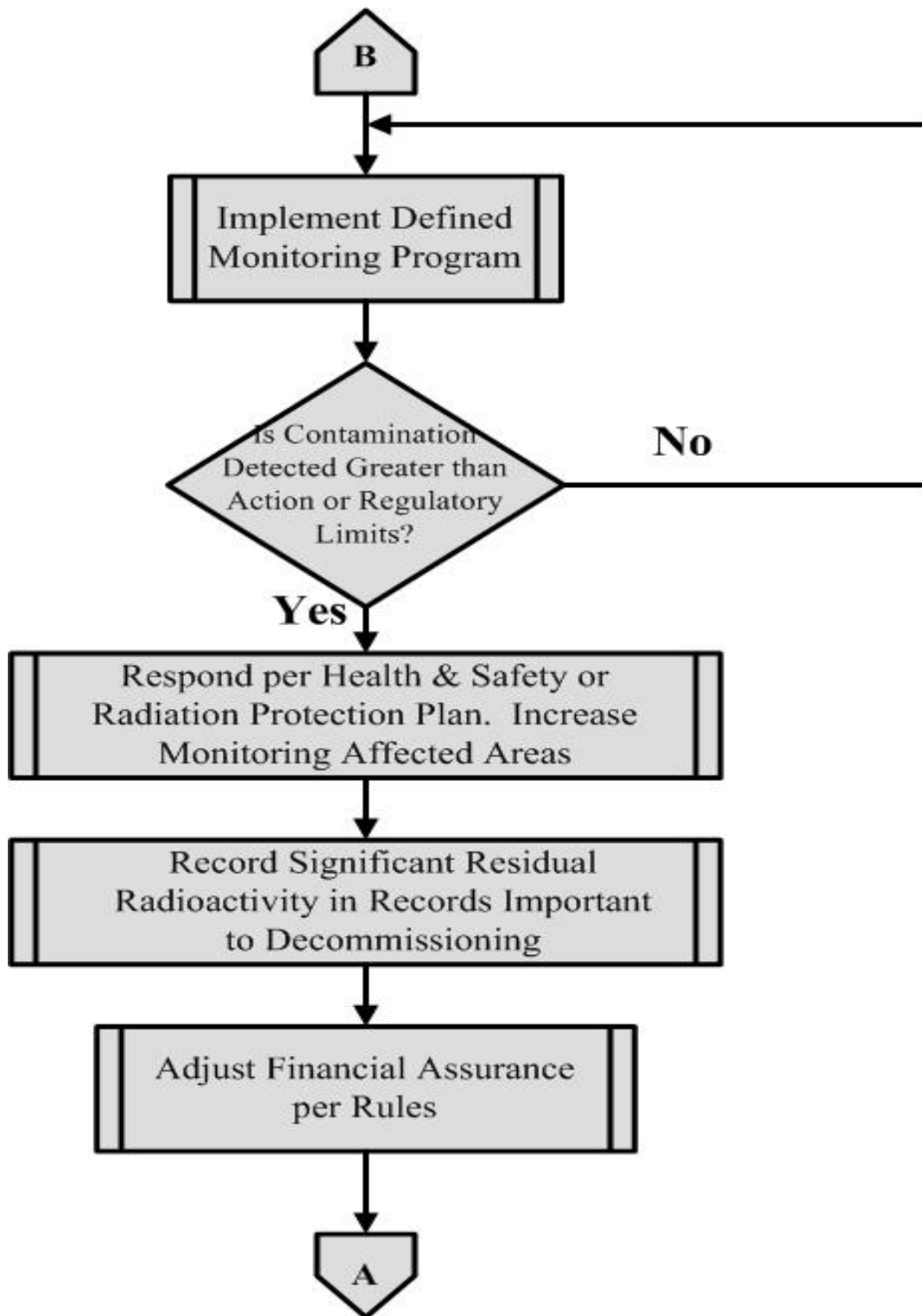


Figure 3b What else does the DPR require?



## C. STAFF REGULATORY GUIDANCE

1. Power plant licensees that have implemented the “Industry Ground Water Protection Initiative—Final Guidance Document (NEI 07-07) are considered to have implemented an adequate subsurface monitoring program for residual radioactivity in and around the facility. Thus, nuclear power plant licensees under 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities” and those that operate under 10 CFR 52.103, “Operation under a combined license,” that have implemented NEI 07-07 are presumed to be in compliance with the subsurface survey requirements of the DPR. Those licensees should ensure that the results of all surveys conducted per existing monitoring and surveillance programs, including NEI 07-07, that identify significant residual radioactivity are recorded, or incorporated by reference, in records important to decommissioning as specified in 10 CFR 50.75(g).

Existing regulations at 10 CFR 50.75(f)(3) require that each power reactor licensee, at or about 5 years prior to the licensee’s projected end of operations, submit a preliminary decommissioning cost estimate. Licensees should include the results of the surveys in this estimate. The site-specific cost estimate required by 10 CFR 50.82(a)(8)(iii) should also include the costs of removing and disposing of significant residual radioactivity.

Section 20.1501(b) does require that licensees document the results of the surveys in records important to decommissioning. NRC is not requiring licensees to submit reports of survey results.

2. For Part 30, 40, and 70 licensees, if the quantity of material authorized in the license is below the amount requiring financial assurance as specified in 10 CFR 30.35(d), 40.36(b) and 70.25(d), the DPR does not require any further action. The NRC presumes that such licensees will have minimal residual radioactivity resulting from operations, have current As Low As Reasonably Achievable (ALARA) and health and safety programs that are adequate to identify radioactivity requiring remediation, and will have funds from operating revenues to remediate the facility to unrestricted use criteria.

3. Staff experience (Ref. 9) shows that fluids are the primary source of contamination beyond facility equipment. If there are no fluid processes, the NRC presumes that licensees’ current ALARA and health and safety programs are adequate to identify radioactivity requiring remediation to meet unrestricted use criteria. The DPR requires action only if there are fluids (gases or liquids), dispersible powders, aerosols, or nanoparticles in site processes, including hoods.

4. Affected licensees should review, and adjust if necessary, procedures and practices to ensure early identification of potential or actual radiological releases to the environment and take timely action to minimize the spread of radioactivity in accordance with the DPR.

Section 20.1406(c) requires all licensees to minimize the introduction of radiological contamination into the environment. To do so, licensees should implement procedures and practices that minimize the occurrence of leaks and spills. It should also have procedures and practices that will identify leaks and spills throughout the facility soon after they occur. As part of the ALARA program, licensees should have procedures to minimize to the extent practicable the spread of leaks and spills that do occur, especially when the residual radioactivity could migrate to inaccessible areas and eventually to the subsurface. Licensees should review, and update if necessary, the actions to ensure a timely and effective response to unplanned releases of radiological material.

5. Licensees should periodically conduct surveys in accordance with 10 CFR 20.1501(a) to identify the horizontal and vertical extent of significant residual radioactivity throughout the site. As part of this identification effort, licensees may use results from a model that has been demonstrated to be

representative of the physical conditions of the site. Licensees do **not** need to conduct formal, comprehensive site characterization. The required surveys should include, but are not limited to, the following:

- a. building interiors, including in and around joints, drains, hoods, exhaust stacks, and other features that could provide pathways for residual radioactivity to concentrate or migrate to inaccessible areas,
- b. the soil and other media in outside areas at the facility,
- c. subsurface media, especially around building footers, subsurface pipes and conduits, and below-grade tanks, and
- d. ground water.

The DPR does not alter the existing requirement to conduct surveys reasonable under the circumstances to evaluate the magnitude and extent of residual radioactivity. It does explicitly state in 10 CFR 20.1501(a) that the subsurface must be included in these surveys. The intent of the rule is to ensure that licensees identify the extent of significant residual radioactivity on site; therefore, licensees should survey in places where such residual radioactivity is more likely to exist. Licensees should also evaluate the potential for significant residual radioactivity to migrate and to concentrate such that it would not meet the release for unrestricted use criteria of § 20.1402. That is, if the existing significant residual radioactivity will naturally reduce to levels that meet unrestricted release criteria by the time of license termination, the DPR does not require any further action. For NRC licensees who have subsurface residual radioactivity with no current or projected groundwater contamination, a minimal, routine monitoring plan may remain in effect through license termination activities.

The DPR also places a lower bound on the amount of residual radioactivity that licensees should record: that which would require remediation at the time of license termination to meet the unrestricted release criteria of 10 CFR 20.1402. However, records of surveys performed that demonstrate that the residual radioactivity has not exceeded the level of significant residual radioactivity may be useful in demonstrating compliance.

6. All licensees must document the results of the surveys required by 10 CFR 20.1501(a) in records important to decommissioning in accordance with 10 CFR 20.1501(b).

The DPR modifies the recordkeeping provisions of 10 CFR 20.1501. It requires that licensees maintain survey results with records important to decommissioning until license termination. Licensees may do this either by physical colocation or by reference to other readily available record files. It does not require licensees to submit reports of survey results.

7. The DPR does not require licensees to perform any dose analyses; however, licensees can use dose assessments on a site-specific basis to determine whether the amount of residual radioactivity is significant with respect to meeting the radiological criteria for unrestricted use in § 20.1402. Alternatively, a licensee should make a reasonable effort to estimate the amount of the identified residual radioactivity that would require remediation to meet the release for unrestricted use criteria of 10 CFR 20.1402 at the time it intends to terminate the license. Consideration should be given to the following:

- a. the radionuclides in the source term,
- b. actual and potential migration, both vertical and horizontal,
- c. dilution and natural attenuation, and
- d. radioactive decay.

Licensees can estimate the amount of significant residual radioactivity by comparing the concentrations and exposure rates they measure with readily available data to determine if they may need to conduct remediation to meet release for unrestricted use criteria for license termination. Available sources for this comparison include the following:

- a. Table 2 of Appendix B to 10 CFR Part 20, “Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage,” (ne half the table values equates to 25 millirem/year),
- b. the screening values in Appendix H to NUREG-1757, Volume 2, “Characterization, Survey, and Determination of Radiological Criteria,” Revision 1, issued September 2006 (Ref. 10), and
- c. remediation levels (derived concentration guidelines) in final status survey plans that have been approved by NRC for other facilities.

Licensees, except those whose financial assurance for decommissioning is determined by a fixed formula, should adjust the decommissioning fund so that it will be sufficient to complete decommissioning at the time of license termination. If a licensee identifies residual radioactivity that would require remediation to terminate the license, it should increase the value of the fund to account for the added cost. Likewise, if a licensee elects to remediate during the operational phase of facility life, it may reduce the fund to account for remediation it has completed; the remaining fund must be sufficient to complete any remediation necessary to meet release criteria.

The ultimate goal of the DPR is for licensees to have sufficient funds to effectively and efficiently conduct site remediation and terminate their licenses. This means having an adequate decommissioning trust fund. For the trust fund to be adequate, it must include sufficient funds to remove and dispose of all of the residual radioactivity that is above release for unrestricted use criteria at the time of license termination. That is, it must cover the costs of packaging, shipping, and disposal for the total amount of material to be removed from the site in addition to surveys to demonstrate compliance with approved release criteria. A trust fund is only one type of financial assurance instrument and might not be required of materials licensees. Those licensees subject to 10 CFR 30.35(c)(6), 40.36(a), or 70.25(d) would have a decommissioning funding plan cost estimate and would not necessarily have a trust fund.

Nuclear power plant licensees should include the results of surveys in computing the site-specific cost estimates required by 10 CFR 50.75(f)(3) and 10 CFR 50.82(a)(8)(iii).

## D. IMPLEMENTATION

The purpose of this section is to provide information on how applicants and licensees<sup>1</sup> may use this guide and information regarding the NRC's plans for using this regulatory guide. In addition, it describes how the NRC staff complies with the Backfit Rule (10 CFR 50.109) and any applicable finality provisions in 10 CFR Part 52.

### Use by Applicants and Licensees

Applicants and licensees may voluntarily<sup>2</sup> use the guidance in this document to demonstrate compliance with the underlying NRC regulations. Methods or solutions that differ from those described in this regulatory guide may be deemed acceptable if they provide sufficient basis and information for the NRC staff to verify that the proposed alternative demonstrates compliance with the appropriate NRC regulations.

Licensees may use the information in this regulatory guide for actions which do not require NRC review and approval such as changes to a facility design under 10 CFR 50.59. Licensees may use the information in this regulatory guide or applicable parts to resolve regulatory or inspection issues.

### Use by NRC Staff

During regulatory discussions on plant specific operational issues, the staff may discuss with licensees various actions consistent with staff positions in this regulatory guide, as one acceptable means of meeting the underlying NRC regulatory requirement. Such discussions would not ordinarily be considered backfitting even if prior versions of this regulatory guide are part of the licensing basis of the facility. However, unless this regulatory guide is part of the licensing basis for a facility, the staff may not represent to the licensee that the licensee's failure to comply with the positions in this regulatory guide constitutes a violation.

If an existing licensee voluntarily seeks a license amendment or change and (1) the NRC staff's consideration of the request involves a regulatory issue directly relevant to this regulatory guide and (2) the specific subject matter of this regulatory guide is an essential consideration in the staff's determination of the acceptability of the licensee's request, then the staff may request that the licensee either follow the guidance in this regulatory guide or provide an equivalent alternative process that demonstrates compliance with the underlying NRC regulatory requirements. This is not considered backfitting as defined in 10 CFR 50.109(a)(1) or a violation of any of the issue finality provisions in 10 CFR Part 52.

The NRC staff does not intend or approve any imposition or backfitting of the guidance in this regulatory guide. The NRC staff does not expect any existing licensee to use or commit to using the guidance in this regulatory guide, unless the licensee makes a change to its licensing basis. The NRC staff does not expect or plan to request licensees to voluntarily adopt this regulatory guide to resolve a generic regulatory issue. The NRC staff does not expect or plan to initiate NRC regulatory action which would require the use of this regulatory guide. Examples of such unplanned NRC regulatory actions include issuance of an order requiring the use of the regulatory guide, requests for information under

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<sup>1</sup> In this section, "licensees" refers to licensees of nuclear power plants under 10 CFR Parts 50 and 52; and the term "applicants," refers to applicants for licenses and permits for (or relating to) nuclear power plants under 10 CFR Parts 50 and 52, and applicants for standard design approvals and standard design certifications under 10 CFR Part 52.

<sup>2</sup> In this section, "voluntary" and "voluntarily" means that the licensee is seeking the action of its own accord, without the force of a legally binding requirement or an NRC representation of further licensing or enforcement action.

10 CFR 50.54(f) as to whether a licensee intends to commit to use of this regulatory guide, generic communication, or promulgation of a rule requiring the use of this regulatory guide without further backfit consideration.

Additionally, an existing applicant may be required to adhere to new rules, orders, or guidance if 10 CFR 50.109(a)(3) applies.

If a licensee believes that the NRC is either using this regulatory guide or requesting or requiring the licensee to implement the methods or processes in this regulatory guide in a manner inconsistent with the discussion in this Implementation section, then the licensee may file a backfit appeal with the NRC in accordance with the guidance in NUREG-1409 and NRC Management Directive 8.4.

## GLOSSARY

**monitoring**—the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material

**residual radioactivity**—radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee's control. This includes radioactivity from all licensed and unlicensed sources used by the licensee, but excludes background radiation.

**significant residual radioactivity**—an amount of radioactive material that would require remediation to meet the unrestricted use criteria specified in 10 CFR 20.1402 at the time of decommissioning

**subsurface**—any media below about 15 cm (6 In) from a surface

**survey**—an evaluation of the radiological conditions and potential hazards of radioactive material. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.



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8. U.S. Nuclear Regulatory Commission, “Consolidated Decommissioning Guidance,” NUREG-1757, Volume 3, Revision 1, “Financial Assurance, Recordkeeping, and Timeliness,” Revision 1, Nov 2011, ADAMS Accession No. ML090850301.
9. Snyder, Amy N. and David Brown, through Andrew Persinko, “General Guidance for Inspections and Enforcement to Prevent Future Legacy Sites, Integrated Decommissioning Improvement Plan (DIP), Revision I, Item 4.23,” Memorandum to Daniel M. Gillen, U.S. Nuclear Regulatory Commission, September 23, 2005, ADAMS Accession No. ML052630421.
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<sup>3</sup> Publicly available NRC published documents are available electronically through the NRC Library on the NRC’s public Web site at <http://www.nrc.gov/reading-rm/doc-collections/>. The documents can also be viewed on-line or printed for a fee in the NRC’s Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD; the mailing address is USNRC PDR, Washington, DC 20555; telephone 301-415-4737 or (800) 397-4209; fax (301) 415-3548; and e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov).

**APPENDIX A**

**EXPLANATION OF RISK-INFORMED APPROACH TO DETERMINING  
ACTIONS TO COMPLY WITH  
THE DECOMMISSIONING PLANNING RULE**

## **APPENDIX A-1**

### **DISCUSSION OF FIGURES 1–3**

This appendix discusses the individual pieces of Figures 1 through 3 in the guidance on implementing the Decommissioning Planning Rule (DPR). It does not present any regulatory information. This appendix only provides additional information on the U.S. Nuclear Regulatory Commission (NRC) staff's intentions in developing the risk-informed approach to implementing the DPR.

## Discussion of Figure 1. Does the DPR affect me?

The first step in the process is for each licensee to determine if it needs to take any action because of the changes to Title 10 of the *Code of Federal Regulations* (10 CFR), sections 20.1406, “Minimization of Contamination,” and 20.1501, “General.” The first action that any licensee would have to perform would be a comprehensive review of its existing monitoring and surveillance plans.

Determine if Reviews are Necessary to Comply with Revised  
10 CFR 20.1406 & 10 CFR 20.1501

Is Licensee Uranium Recovery (10 CFR 40, Appendix A)?

The first question to ask in making this determination is whether or not the current license is a uranium recovery license under 10 CFR Part 40, “Domestic Licensing of Source Material,” Appendix A, “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content.” If the answer is no, further actions are necessary because these licensees are specifically exempt from the requirements of the DPR under 10 CFR 20.1401(a).

**Exempt  
No Action**

The second question is whether or not the licensee is a power plant licensed under 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.” If so, the NRC has determined that the monitoring and surveillance activities that Part 50 licensees are conducting as part of existing as low as is reasonably achievable (ALARA) and radiological and environmental monitoring program activities, and the Nuclear Energy Institute (NEI) Ground Water Protection Initiative (NEI 07-07), meet or exceed the requirements of 10 CFR 20.1501(a). Therefore, the DPR does not impose any additional survey or monitoring requirements on these licensees.

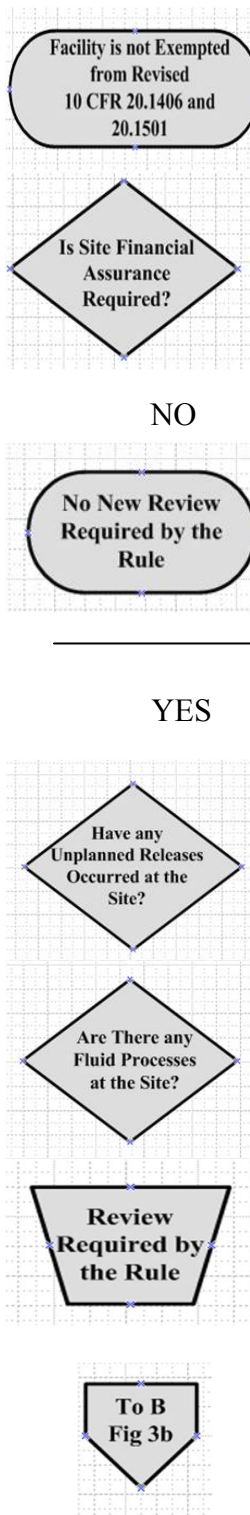
The DPR does require that Part 50 nuclear power plant licensees record the results of the existing monitoring and sampling programs in their 10 CFR 50.75(g) files, either directly or by reference.

Is Licensee NPP (10 CFR 50 or 10 CFR 52)?

10 CFR 50.75(f)(3) requires a preliminary decommissioning cost estimate, which includes an up-to-date assessment of the major factors that could affect the cost to decommission. Section 50.82(a)(9)(ii)(F) requires an updated site-specific estimate of remaining decommissioning costs. The results of the monitoring and sampling should be included in these estimates.

If the answer to the second question is no (the licensee is not licensed under Part 50), proceed to Figure 2 to determine the next actions.

Document in 10 CFR 50.75(g).  
Include in 10 CFR 50.75(f)(3) Cost Estimate.



## Discussion of Figure 2. Does the DPR really require me to do something?

For purposes of the DPR, the NRC is using the requirement for financial assurance as a surrogate for the amount of material a licensee is authorized to possess. NRC regulations at 10 CFR 30.35, 40.36, and 70.25, each entitled “Financial Assurance and Recordkeeping for Decommissioning,” require some licensees to set aside funds devoted to decommissioning the site at the time of license termination. The amount of funds is a function of how much radiological material the licensee is authorized to possess. Licensees can meet the financial assurance requirements either by the methods specified in those regulations, or by a site-specific estimate.

If a licensee’s possession limit does not require it to have financial assurance, the DPR does not require the licensee to perform any further action because the potential for significant residual radioactivity is low. These licensees should continue executing the existing ALARA and health and safety programs as discussed in Figure 3b.

If, however, regulations do require financial assurance, either by formula or by site-specific estimate, the licensee must determine if there have been previous spills or leaks during the operating history of the site. Also, the licensee must identify the potential for such events to occur in the future. Staff experience (Ref. 9) shows that the presence of liquid or gaseous processes presents the possibility of unplanned or unmonitored releases. Further, after planned discharges within regulatory limits, fluids can concentrate in various locations to greater than release limits. Therefore, if fluids are part of the operations at the site, licensees should conduct a more detailed review of monitoring and survey plans to ensure that they will identify the sources and extent of future leaks or spills. The outflow of hoods, which can move particulates beyond the facility, should also be considered. The amount of review depends on the complexity of the process and facility, and on the potential release.

If there are no fluids in the site processes, no further review is required by the DPR, and licensees should continue implementing existing plans as illustrated in Figure 3b.

Review Existing Monitoring/Surveillance Plans and Identify any Recent Changes to Facility Operations or Configurations

### Discussion of Figure 3a. What does the DPR require me to do?

Licensees should review existing plans and procedures related to identification and management of leaks, spills, aerosols, dispersible solids, and other unplanned releases. Licensees should pay particular attention to identifying any changes in the facility operations, such as revisions to specifications for products, addition of new products or discontinuation of previous products, and changes to the process rate since the last revision to the procedures. The review should also note any physical changes to the facility, especially those that could result in unanalyzed release paths, such as new discharge ducts or piping. These changes are not limited to those in the immediate vicinity of the process. For example, rerouted plumbing could result in irregular fittings in normally inaccessible areas; or construction of a tall building on adjacent land could alter the airborne discharge paths.

Any Unmonitored Areas in Buildings or Outside Where Spills/Leaks Could Occur?

Any Unmonitored Areas On-Site for Effluents to Concentrate?

The ultimate goal of the DPR is for licensees to identify the extent of contamination on the site and reserve enough money during operations to complete site remediation and license termination in a timely manner at the end of operations. In this review, licensees should identify any areas of the site not currently monitored regularly for radiological contamination. In addition to “under-” sources (such as embedded or buried pipes, tanks, valves, and onsite disposals under 10 CFR 20.2002, “Method for Obtaining Approval of Proposed Disposal Procedures”), leaks and spills onto interior or exterior surfaces may migrate through floor joints, cracks, failed seals, or through porous media to other areas. Some of these areas may not be readily accessible for direct observation. In these cases, licensee should consider alternatives to identify potential contamination, such as use of remote sensors and robotics. Contamination could also enter utility conduits and move far from the point of origin. If the contamination moves into the subsurface, it could concentrate there over time, or it could migrate through ground water to other locations where it could concentrate. Likewise, airborne effluents may precipitate and concentrate in some pattern because of the local meteorology, such as prevailing wind direction and speed, and relative humidity. Licensees should identify these potential locations and include them in survey and monitoring plans.

**Revise Monitoring/  
Surveillance Plans as  
Necessary to Monitor  
Potentially Impacted  
Areas Including  
Subsurface**

At the time of license termination, 10 CFR Part 20, “Standards for Protection against Radiation,” Subpart E, “Radiological Criteria for License Termination,” requires licensees to remediate existing residual radioactivity above release levels without regard to cost. Therefore, licensees must have a sufficient monitoring plan to identify the complete extent of contamination at that time. The goal of the DPR is to encourage licensees to develop plans that will identify contamination as it occurs rather than wait until license termination when significant amounts of previously unknown contamination can result in sizeable cost and time overruns during decommissioning.

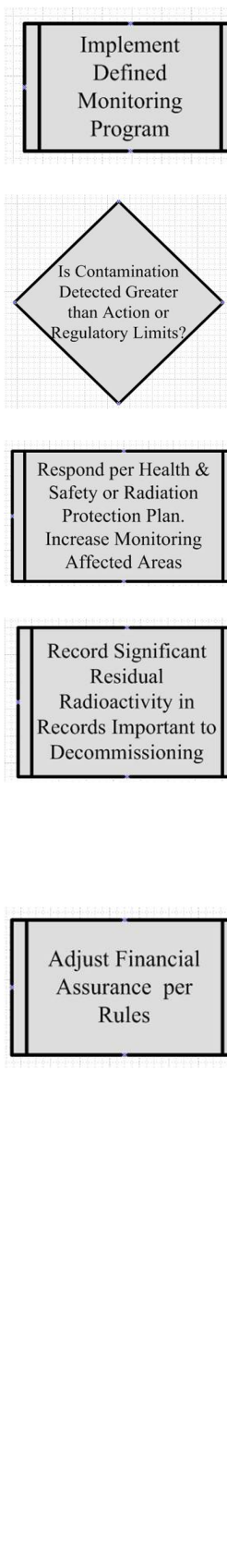
For licensees that do not have significant residual radioactivity because they possess small amounts of short-lived radioactive material or sealed sources, the staff does not expect significant changes to the existing monitoring and health and safety programs.

For licensees with subsurface residual radioactivity but no ground water implications, a minimal, routine monitoring plan may be sufficient through operations.

Licensees other than those described above should enhance the existing programs to include areas of potential contamination not previously identified. The revised plans should also contain provisions for altering the frequency of surveillance in response to contamination events and the “conclusion” of those events.

**Verify  
Plans with  
NRC**

Surveillance plans are identified in the license, so licensees should discuss changes with the NRC and, if the plans to be changed are specified in the license, obtain prior NRC approval.



**Discussion of Fig 3b. What else does the DPR require?**

Once a licensee has an approved plan(s) for monitoring and surveillance, whether changed or not as a result of review, it should conduct the activities specified in the plan(s).

So long as there are no readings above the limits specified in the plans, the DPR does not require any additional actions. Licensee should continue to implement the existing plans routinely.

If the results of the sampling are above the specified limits, the licensee should respond according to the site health and safety plan. This response should include defining the extent of contamination, identifying and implementing corrective actions to mitigate the event (locate and stop the leak or spill), and remediating the area to meet occupational requirements. Once it completes those actions, the licensee should conduct additional periodic monitoring for a time to ensure that the “fix” is effective.

Another important part of the DPR is the requirement in 10 CFR 20.1501(b) that licensees record the results of surveys identifying significant subsurface residual radioactivity—requiring remediation to meet unrestricted use criteria—in records important to decommissioning. This will assist in planning and costing remedial actions and surveys to support license termination. It also provides important input to the historical site assessment required by the decommissioning section of the NRC’s licensing regulations.

Once this information is collected, licensees should use it in revising decommissioning cost estimates, as appropriate to license type requirements. Nuclear power plant licensees should include it in the decommissioning cost estimates required by 10 CFR 50.75(f)(3) and 10 CFR 50.82(a)(8)(iii). Other licensees should adjust financial assurance for decommissioning to reflect the necessary remediation to meet unrestricted release criteria at the time of license termination. See NUREG-1757, Volume 3, Revision 1, “Financial Assurance, Recordkeeping, and Timeliness,” issued 2011 (ADAMS Accession No. ML090850301), for additional information. If a licensee has adjusted its financial assurance in response to previous contamination events, it could elect to conduct partial site remediation during operations. If this results in a decrease in the remaining remediation necessary to meet unrestricted release limits, it could also result in a decrease in the required trust fund amount. The staff encourages licensees to evaluate the total costs of prompt versus delayed remediation. Nothing in the DPR mandates remediation during operations.



**APPENDIX A-2**

**EXCERPTS FROM PERTINENT REGULATIONS**

## **10 CFR 20.1003, “Definitions”**

*Residual radioactivity* means radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee’s control. This includes radioactivity from all licensed and unlicensed sources used by the licensee, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of 10 CFR part 20.

## **10 CFR 20.1101, “Radiation Protection Programs”**

(a) Each licensee shall develop, document, and implement a radiation protection program commensurate with the scope and extent of licensed activities and sufficient to ensure compliance with the provisions of this part.

(b) The licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

(c) The licensee shall periodically (at least annually) review the radiation protection program content and implementation.

## **10 CFR 20.1402, “Radiological Criteria for Unrestricted Use”**

A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE [total effective dose equivalent] to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

## **10 CFR 20.1406, “Minimization of Contamination”**

(c) Licensees shall, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with existing radiation protection requirements in Subpart B and radiological criteria for license termination in Subpart E of this part.

## **10 CFR 20.1501, “General” (part of Subpart F, “Surveys and Monitoring”)**

(a) Each licensee shall make or cause to be made, surveys of areas, including the subsurface, that—

- (1) May be necessary for the licensee to comply with the regulations in this part; and
- (2) Are reasonable under the circumstances to evaluate in a timely manner—
  - (i) The magnitude and extent of radiation levels; and
  - (ii) Concentrations or quantities of residual radioactivity; and
  - (iii) The potential radiological hazards of the radiation levels and residual radioactivity detected.

(b) Records from surveys describing the location and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning.

### **10 CFR 30.35, “Financial assurance and recordkeeping for decommissioning”**

(d) Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the \$1,125,000 amount must do so by December 2, 2004. Licensees required to submit the \$113,000 or \$225,000 amount must do so by June 2, 2005. Licensees having possession limits exceeding the upper bounds of this table must base financial assurance on a decommissioning funding plan.

Greater than $10^4$ but less than or equal to $10^5$ times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by $10^4$ is greater than 1 but R divided by $10^5$ is less than or equal to 1.)	\$1,125,000
Greater than $10^3$ but less than or equal to $10^4$ times the applicable quantities of appendix B to part 30 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by $10^3$ is greater than 1 but R divided by $10^4$ is less than or equal to 1.)	225,000
Greater than $10^{10}$ but less than or equal to $10^{12}$ times the applicable quantities of appendix B to part 30 in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in § 30.35(a)(1), divided by $10^{10}$ is greater than, 1, but R divided by $10^{12}$ is less than or equal to 1)	113,000

### **10 CFR 40.36 “Financial assurance and recordkeeping for decommissioning”**

(b) Each applicant for a specific license authorizing possession and use of quantities of source material greater than 10 mCi but less than or equal to 100 mCi in a readily dispersible form shall either—

- (1) Submit a decommissioning funding plan as described in paragraph (d) of this section; or
- (2) Submit a certification that financial assurance for decommissioning has been provided in the amount of \$225,000 by June 2, 2005 using one of the methods described in paragraph (e) of this section. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but before the receipt of licensed material. If the applicant defers execution of the financial instrument until after the license has been issued, a signed original of the financial instrument obtained to satisfy the requirements of paragraph (e) of this section must be submitted to NRC prior to receipt of licensed material. If the applicant does not defer execution of the financial instrument, the applicant shall submit to NRC, as part of the certification, a signed original of the financial instrument obtained to satisfy the requirements of paragraph (e) of this section.

### **10 CFR 50.75, “Reporting and Recordkeeping for Decommissioning Planning”**

(f)(3) Each power reactor licensee shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to decommission.

### **10 CFR 50.82, “Termination of License”**

(a)(8)(iii) Within 2 years following permanent cessation of operations, if not already submitted, the licensee shall submit a site-specific decommissioning cost estimate.

**10 CFR 70.25 “Financial assurance and recordkeeping for decommissioning”**

(d) Table of required amounts of financial assurance for decommissioning by quantity of material. Licensees required to submit the \$1,125,000 amount must do so by December 2, 2004. Licensees required to submit the \$225,000 amount must do so by June 2, 2005. Licensees having possession limits exceeding the upper bounds of this table must base financial assurance on a decommissioning funding plan.

Greater than $10^4$ but less than or equal to $10^5$ times the applicable quantities of appendix B to part 30. (For a combination of isotopes, if R, as defined in § 70.25(a), divided by $10^4$ is greater than 1 but R divided by $10^5$ is less than or equal to 1.)	\$1,125,000
Greater than $10^3$ but less than or equal to $10^4$ times the applicable quantities of appendix B to part 30. (For a combination of isotopes, if R, as defined in § 70.25(a), divided by $10^3$ is greater than 1 but R divided by $10^4$ is less than or equal to 1.)	\$225,000