

NRC INSPECTION MANUAL

RDB

INSPECTION PROCEDURE 84750

RADIOACTIVE WASTE TREATMENT, AND EFFLUENT AND ENVIRONMENTAL MONITORING

Effective Date: 01/01/2021

PROGRAM APPLICABILITY: IMC 2561 Appendix A

84750-01 INSPECTION OBJECTIVES

01.01 To ensure that the radioactive effluent sampling and analysis requirements are satisfied so that discharges of radioactive materials are adequately quantified and evaluated from all established release points and releases from any unmonitored and uncontrolled discharged pathways are precluded.

01.02 To ensure that Radiological Environmental Monitoring Programs (REMP): are effectively implemented consistent with technical specifications (TS) and the offsite dose calculation manual (ODCM); quantifies the impact of radioactive effluent releases to the environment and sufficiently validates the integrity of the radioactive gaseous and liquid release program; and meets the design objectives in Appendix I to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.

01.03 To monitor the licensee's continued implementation of the voluntary NEI/Industry Ground Water Protection Initiative (GPI).

84750-02 INSPECTION REQUIREMENTS

02.01 Changes in the Offsite Dose Calculations Manual (ODCM), Process Control Program (PCP), and Radwaste System Design and Operation

Review any significant changes made by the licensee to the ODCM, PCP, as well as to the liquid, gaseous, and solid radwaste system design and operation since the last inspection to ensure adequate evaluation and implementation is within the site's licensing basis and regulations.

02.02 Radioactive Gaseous and Liquid Effluent Treatment

- a. As applicable, perform walk downs of the effluent monitoring ventilation and discharge systems with a focus on any temporary systems or any system with recent changes to verify that the current system configurations, flow paths, and operation are consistent with the description in the Decommissioning Safety Analysis Report (DSAR), ODCM, and site procedures.

- b. Verify appropriate calibration of a sample of effluent monitors and for any changes to effluent monitor set points, evaluate the basis for changes to ensure that an adequate justification exists and does not adversely impact the licensee's ability to monitor releases.
- c. Review (1 - 3) radioactive liquid and gaseous waste discharge permits, as applicable, including all abnormal gaseous and liquid tank discharges. Verify that the projected doses to members of the public are accurate, within 10 CFR Part 50, Appendix I and Technical Specification dose criteria, and based on representative samples taken from the discharge path.
- d. Verify that the licensee's annual Radiological Effluent Release Report was submitted as required, that any anomalous results, unexpected trends, or abnormal releases identified were entered into the corrective action program and adequately resolved, and that the reported doses are below regulatory requirements.

02.03 Radiological Environmental Monitoring Program

When inspecting co-located decommissioning units in Categories 6 and 7, inspectors shall limit inspection efforts of items a – f below to reviewing any unit specific items to take credit for the Reactor Oversight Process (ROP) inspections under IP 71124.07.

- a. Verify licensee environmental monitoring equipment is properly located, calibrated and maintained, and environmental samples are adequately collected by sampling paperwork review and observation, as appropriate.
- b. Review the licensee's implementation of the Groundwater Protection Initiative program and document incomplete or discontinued elements, as applicable.
- c. Assess whether identified leakage or spill events and entries were appropriately added to the records as required by 10 CFR 50.75 (g). Evaluate whether the source of the leak or spill was identified and whether mitigation or remediation actions were appropriately taken as needed, including any contamination of groundwater.
- d. Verify that the licensee's annual REMP was submitted as required, that any anomalous results, unexpected trends or abnormal environmental impacts identified were entered into the corrective action program and adequately resolved, and that the REMP was implemented in accordance with the technical specifications and ODCM.
- e. If applicable, verify that the meteorological instruments are operable, calibrated, and maintained in accordance with guidance contained in the Final Safety Analysis Report (FSAR), and licensee procedures.
- f. If the licensee uses a vendor laboratory to analyze REMP samples, verify that the vendor's quality control program, including inter-laboratory comparison programs, is adequate.
- g. Review the technical validity of any changes made to the REMP Program.

02.04 Problem Identification and Resolution. Verify that the licensee is identifying problems related to radioactive waste storage, processing, and transportation activities at an appropriate threshold and entering them into the corrective action program. If applicable, for a sample of problems documented in the corrective action program, verify that the licensee has identified and implemented appropriate corrective actions.

84750-03 INSPECTION GUIDANCE

General Guidance

The inspector is not required to complete all of the inspection requirements listed in this Inspection Procedure (IP), nor is the inspector limited to those inspection requirements listed if additional safety concerns are identified. However, the objectives of this IP should be met. Due to variance in decommissioning strategies and timelines, inspection effort is expected to vary based on the phase of decommissioning and changes made to the programs. It is expected that effluents and environmental impacts will change as the site continues through decommissioning. The inspector should be cognizant of potential changes due to the change of steady state conditions, i.e. new release points created due to dismantlement of systems, structures, and components and other inadvertent impacts. An inspection focus, as applicable, should be on any changes the site makes to their radwaste, liquid, and/or gas effluent systems.

Inspectors should select inspection items using a performance based, risk-informed approach, while also considering variety. Inspectors should review a sampling of past inspection reports to inform their selection.

Specific Guidance

03.01 Changes in the ODCM, PCP, and Radwaste System Design and Operation

The existence of certain plant structures, systems, and components (and the associated radiological source terms) may change as plants transition from an operating power reactor to a decommissioning reactor facility. As such, inspections should focus on areas of this procedure applicable to the current status of the plant to ensure adequate justification and appropriate implementation of changes. If described in the DSAR, the licensee may be able to utilize the change criteria from 10 CFR 50.59 (Changes, Tests and Experiments) to update some facility monitoring requirements. Additionally, changes to the ODCM must be evaluated separately in accordance with Technical Specification or Quality Assurance Program requirements. Consider reviewing the technical basis or evaluations of any changes to the ODCM to determine whether they were technically justifiable and maintain effluent releases as low as reasonably achievable (ALARA). Check descriptions provided in the licensee's most recent Radioactive Effluent Release Reports of major design changes to the solid radwaste processing system and changes to the Process Control Program.

03.02 Radioactive Gaseous and Liquid Effluent Treatment

- a. Inspectors should consider selecting 1-3 effluent radiation monitoring systems, to include at least one liquid and one gaseous system, as available, and verify that effluent/process monitor configurations align with ODCM descriptions. For portions of

the systems that are inaccessible, review the licensee's material condition and surveillance records.

Focus on any flow measurement devices and all accessible point-of-discharge liquid and gaseous effluent monitors of the selected systems. Look for monitor degradation and out-of-service tags. For effluent sampling systems, look for indications of non-representative sampling such as severe bends in sample line tubing, non-isokinetic sampling, or lack of heat tracing in areas where temperature extremes could have an impact (causing condensation and plate-out). Additionally, be alert to degraded ventilation system connections (e.g., flexible duct connectors) that could contribute to releases. Guidance on sampling systems is contained in American Nuclear Standards Institute (ANSI) N13.1- 1969/1999, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," and ANSI N13.10-1974/ANSI N42.18-2004, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

When possible for liquid waste processing, observe the routine processing and discharge of effluents (including sample collection and analysis) to verify that appropriate effluent treatment equipment is being used and that radioactive liquid waste is being processed and discharged in accordance with procedure requirements and aligns with discharge permits.

- b. Evaluate any significant changes to the licensee's effluent release points since the last inspection to verify they were adequately evaluated. For the systems selected above, verify that the systems are operational with their alarm/trip setpoints properly set, properly calibrated, and maintained as specified in the ODCM or in the radiological effluent technical specifications (RETS), as appropriate. Determine if the set points are based on an appropriate effluent radionuclide (noble gas) mix so as not to exceed the effluent dose limits in 10 CFR Part 20 and the design constraints in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." The radionuclide mix used in the calculation should be the same as or more conservative (lower average energy) than the licensee's actual source term mix.

For significant, new effluent discharge points (such as significant or continuing leakage to ground water that continues to impact the environment if not remediated), determine if the ODCM was updated to include the new release point and includes the bases for all new assumptions and parameters used in dose calculations. Inspectors should note that in accordance with Regulatory Guide 1.109, a significant new exposure pathway exists if a conservative evaluation yields an additional dose increment equal to or more than 10 percent of the total from all exposure pathways considered in Regulatory Guide 1.109. Review whether the licensee obtained appropriate permits.

Focus on point of discharge effluent monitors and others, if time permits. Guidance on calibration program requirements is in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste"; Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment"; and ANSI Standard N13.1-1969/1999, "Sampling Airborne

Radioactive Materials in Nuclear Facilities. If an instrument is not calibrated correctly, determine generic applicability and actual and potential exposure impact, and assess the impact with respect to control or emergency preparedness. Deficiencies should be entered into the licensee's corrective action program. Notify regional Emergency Preparedness inspector if any issues are found with effluent monitors found in the licensee's approved emergency action level scheme.

- c. For the radioactive liquid and gaseous waste discharges reviewed, verify that the calculated doses, using the calculations specified in the ODCM, (monthly, quarterly, and annual dose) are within the 10 CFR Part 50, Appendix I and Technical Specification dose criteria. If discharges were made with inoperable effluent radiation monitors, or if unmonitored leakage occurred, verify that an evaluation was made of the discharge to satisfy the survey requirements of 10 CFR 20.1501. Consider discharges resulting from misaligned valves and valve leak-by, etc.

Inspectors should note that, in general, discharge points that are secondary dispersion/dilution points (i.e., those originating from authorized effluent discharges such as rain-out into storm drains or drainage from equipment condensation, including freezers) may not need further evaluation. However, the discharge of radioactive material from unusual discharge points (e.g., pumping of water from cable trays) needs an evaluation prior to discharge. This evaluation can be a bounding evaluation for less significant release points (see Regulatory Guide 1.21, Rev. 2). Some changes may require a 10 CFR 50.59 review, or prior NRC approval (e.g., burning contaminated oil in an auxiliary boiler). Consider if changes are subject to 10 CFR 50.59 reviews or NRC approval (e.g., alternate discharge points).

- d. Review the evaluation of discharges from onsite surface water bodies that contain or potentially contain radioactivity, and the potential for ground water leakage from these onsite surface water bodies. Determine if the licensee is properly accounting for discharges from these surface water bodies as part of its effluent release reports. Note that an area where an unplanned release occurred into the on-site environs (e.g., a leak or spill) should be identified as an "impacted area" for decommissioning purposes in accordance with NUREG-1757, "Consolidated Decommissioning Guidance," issued September 2006.

03.03 Radiological Environmental Monitoring Program

Inspection effort for this requirement is expected to vary significantly throughout the phases of decommissioning. When a site is not co-located with an operating reactor and is in a steady state, i.e. SAFSTOR for a number of years, the inspector should focus on any changes or abnormalities found with a spot check on the program itself. When a site is in active decommissioning, the inspector should perform all of the inspection requirements, as applicable and available. For co-located sites, the inspector should focus on unit specific items and credit the applicable reactor oversight process inspections at the operating unit to avoid duplication of inspection efforts.

- a. Dependent on the current category of decommissioning and whether the site is co-located with an operating unit, the inspector should consider implementing all or some of the following guidance, as appropriate. The inspector should consider walking down 1-3 air sampling stations and thermoluminescent dosimeter (TLD) monitoring stations to determine whether they are located as described in the ODCM and to

determine the equipment material condition. For selected air samplers, review the calibration and maintenance records to verify that they demonstrate adequate operability of these components. The inspector could consider observing the collection and preparation of 1-2 environmental samples from different environmental media and verify that environmental sampling is representative of the release pathways as specified in the ODCM and that sampling techniques are in accordance with procedures. As available, evaluate the licensee's actions in response to 3-5 events that involved a missed sample, inoperable sampler, lost TLD, or anomalous measurement.

- b. Review the licensee's monitoring results to implement the voluntary NEI/Industry GPI to determine if the licensee has implemented its program as intended, and to identify any anomalous results. For anomalous results or missed samples, determine if the licensee has identified and addressed deficiencies through its corrective action program. Determine whether the licensee completed offsite notifications as provided in its GPI implementing procedures. Inspectors should review whether licensees have committed to implementing this initiative and inspect the program and any changes to it accordingly.

Inspectors should note that for Part 50 licensees, adequate implementation of the NEI-GPI provides one acceptable method of implementing the Decommissioning Planning Rule requirements in 10 CFR 20.1406 and 10 CFR 20.1501 in accordance with Regulatory Guide 4.22, "Decommissioning Planning during Operations." If the licensee chooses other methods of implementing these requirements, review those methods of implementation. For 10 CFR Part 52 licensees, in addition to complying with 10 CFR 20.1406, licensees are committed to implementing the GPI as part of their licensing basis, including use of the NEI 08-08A, "Generic FSAR Template Guidance for Life-Cycle Minimization of Contamination" as implemented in design features and operational programs.

- c. Assess whether sufficient radiological surveys were performed to evaluate the extent of the contamination and the radiological source term. Verify that a survey/evaluation has been performed to include consideration of hard-to-detect radionuclides. Note that the use of scaling factors can be used in bounding calculations. 10 CFR 50.75(g) files (or corrective action program files referencing 50.75(g) files) should contain a description of the leak or spill (isotopes and quantities), location and size of the impacted area, cross reference to survey results, and results of any remediation performed if undetected leakage has occurred or is suspected and insufficient monitoring/remediation actions have been taken by the licensee. Discuss any undetected leakage and insufficient monitoring with your supervisor. If assistance in assessing the adequacy of the licensee's onsite/offsite monitoring activities is needed and/or site hydrologic characteristics are not clearly defined, the program office should be consulted.

Review onsite contamination events involving contamination of ground water. Inspectors should note that limited, defined documentation of the review of abnormal or unplanned radioactive discharges (e.g., leaks and spills) should be provided in the inspection reports. Inspectors should verify that on-site ground water sample results and a description of any significant onsite leaks/spills into ground water for each calendar year are documented in the Annual Radiological Environmental Operating Report (AREOR) for REMP or the Annual Radiological Effluent Release Report (ARERR).

For unmonitored spills, leaks, or unexpected liquid or gaseous discharges, ensure that an evaluation was performed to determine the type and amount of radioactive material that was discharged. Assess whether sufficient radiological surveys were performed to evaluate the extent of the contamination and the radiological source term. Verify that a survey/evaluation has been performed to include consideration of hard-to-detect radionuclides.

Review missed and or anomalous environmental samples to identify if they should be reported in the annual environmental monitoring report. Review the licensee's assessment of any positive sample results (i.e., licensed radioactive material detected above the lower limits of detection (LLDs). Review the associated radioactive effluent release data that was the source of the released material. Ensure that the licensee has addressed any positive indications in the environmental monitoring samples and has adjusted the effluent monitoring program and dose modeling, as appropriate to ensure the accuracy of the models. (See Section 6.8 in NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," and in NUREG-1302, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors," issued April 1991.)

- d. The inspector should review whether the meteorological data readout and recording instruments in the control room and at the tower are operable, if applicable. Compare readout data (i.e., wind speed, wind direction, and delta temperature) in the control room and at the meteorological tower to identify any differences that would indicate that inaccurate data are being used for dose determination. Inspectors should note that this program may become defunct after fuel is in an ISFSI and that most 10 CFR Part 50 licensees will not be committed to Regulatory Guide 1.23, "Meteorological Monitoring Programs for Nuclear Power Plants," but may be committed to Safety Guide 23, "Onsite Meteorological Programs," (1972).
 - e. Inspectors should review the results of the licensees' inter-laboratory comparison program to verify the adequacy of environmental sample analyses performed by the licensee. If applicable, review the licensee's determination of any bias to the data and the overall effect on the REMP. Regulatory Guides 1.33, 1.21 and 4.15 provide guidance for licensees participating in an intra-laboratory and inter-laboratory comparison program to verify the quality of analyses.
 - f. Depending on the phase of decommissioning, there may be significant or on-going adjustments to the REMP or the ODCM. Inspectors should review the justification behind the changes especially as units undergo demolition and consider performing walk downs of any changes, as appropriate. Inspectors should consider whether the REMP as implemented with the changes still provides reasonable assurance of adequate monitoring of the environment.
- 03.04 Problem Identification and Resolution. Additional guidance can be found in IP 71152, "Problem Identification and Resolution" and IP 40801, "Problem Identification and Resolution at Permanently Shutdown Reactors."

84750-04 RESOURCE ESTIMATE

Note that for all decommissioning inspection activities, the frequency of performance, level of effort needed, and specific inspection requirements to be evaluated and verified vary based on the stage of decommissioning at the facility, the scope of licensee activities, and the overall decommissioning strategy chosen for the plant (i.e., SAFSTOR or DECON). IMC 2561 contains a discussion of the expected inspection frequency and resource estimates during each phase of decommissioning and should be used when planning resources to conduct this inspection.

84750-05 COMPLETION STATUS

Inspection findings, open items, follow-up items, and conclusions shall be documented in accordance with Inspection Manual Chapter 0610 and other relevant regional or headquarter instructions. Inspections resulting from allegations should be documented and dispositioned in accordance with Management Directive 8.8.

84750-06 REFERENCES

10 CFR Part 20.1406, "Minimization of contamination."

10 CFR Part 20.1501, "Subpart F—Surveys and Monitoring, General."

10 CFR Part 50.75, "Reporting and recordkeeping for decommissioning planning,"

10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents."

ANSI N13.1-1969/1999, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities."

ANSI N13.10-1974/ANSI N42.18-2004, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

American Society for Testing and Materials (ASTM) D5111-12, "Standard Guide for Choosing Locations and Sampling Methods to Monitor Atmospheric Deposition at Non-Urban Locations."

IP 71124.06, "Radioactive Gaseous and Liquid Effluent Treatment."

IP 71124.07, "Radiological Environmental Monitoring Program" "Lessons Learned Task Force (LLTF) Report."

NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors."

NUREG-1302, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors."

NUREG-1757, “Consolidated Decommissioning Guidance.”

Regulatory Guide 1.21, “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste.”

Regulatory Guide 1.23, “Meteorological Monitoring Programs for Nuclear Power Plants.”

Regulatory Guide 1.33, “Quality Assurance Program Requirements (Operation).”

Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I.”

Regulatory Guide 4.15, “Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment.”

Regulatory Guide 4.22, “Decommissioning Planning during Operations.”

Regulatory Issue Summary 08-03, “Return/Re-use of Previously Discharged Radioactive Effluents.”

END

ATTACHMENT 1
Revision History for IP 84750

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	9/30/1988 CN 88-014	Initial issuance for use in the Systematic Assessment of Licensee Performance (SALP) inspection program.	None Required	None
N/A	12/4/1990 CN 90-014	Revised to remove requirements and guidance relating to solid radioactive waste, which is now contained in the new IP 86750.	None Required	None
N/A	3/15/1994 CN 94-006	Revised to reflect the requirements of the new 10 CFR Part 20 and to add a new section addressing the effectiveness of licensee controls.	None Required	None
N/A	ML19270D639 11/14/19 CN 19-036	The procedure was completely re-written and updated to address recent revisions to IMC 2561, overall content and format changes, and to reflect additional lessons learned from ongoing decommissioning activities.	None Required	ML19270D638
N/A	ML20290A843 11/05/20 CN 20-059	Major revision. This procedure was rewritten to refocus inspection efforts to risk-inform the inspection and streamline the procedure based on inspector input. This revision was informed by the recently issued health physics procedures under IP 71124.	None Required	ML20290A844