

PART 52, LIQUID WASTE MANAGEMENT PROGRAM

PROGRAM APPLICABILITY: 2504 Appendix B

84528-01 INSPECTION OBJECTIVES

01.01 Effluents. To determine whether the applicant's effluent and process monitoring program is adequate and conforms with the Final Safety Analysis Report (FSAR) description; whether procedures for instrumentation and equipment to sample and handle radioactivity are adequate; and whether system management is functionally sufficient for expected normal, anticipated operational occurrences (AOO) and accident conditions.

01.02 Liquid Waste Processing. To determine whether the licensee has processes in place to monitor and ensure that the Liquid Waste Management System (LWMS) can be operated as intended by the FSAR; that the applicant's processes for evaluating, installing and using mobile liquid waste processing systems are adequate for the source terms described in the FSAR; that operational procedures have been written and approved for normal operations and AOOs, and that these procedures are adequate for management of radioactive liquid effluents.

01.03 Post-Accident Sampling and Analysis. Determine whether procedures have been approved and are adequate; determine whether instrumentation and equipment to collect samples and handle radioactive samples for accident conditions, are operationally ready.

84528-02 INSPECTION REQUIREMENTS AND INSPECTION GUIDANCE

General Inspection Guidance

If the unit is being constructed at a site with existing, operational units, for which the same or similar programs will be used at all units, then this program may not require the same level of inspection as units being constructed at sites with no existing programs. This is consistent with Section 07.06 of Inspection Manual Chapter 2506, Construction Reactor Oversight Process General Guidance and Basis Document, which states that an "operational program inspection is considered complete when all high level steps in the respective IP have either been completed or an analysis has been conducted accepting the reason for not conducting the steps."

Nuclear Energy Institute (NEI) 07-09A Rev 0, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description," (ADAMS Accession No. ML091050234) fully describes, at the functional level, elements of the process and effluent monitoring and sampling programs required by 10 CFR 50, Appendix I and 10 CFR 52.79(a)(16).

NEI-08-08A Rev 0 "Guidance for Life Cycle Minimization of Contamination," October 2009, (ADAMS Accession No. ML093220530) meets the requirements of 10 CFR 20.1406 for life-cycle minimization of contamination, in part, by addressing the applicable regulatory position elements of Regulatory Guide (RG) 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning." NEI 07-09A in conjunction with NEI 08-08A fully describes the effluent monitoring program. NEI 07-09A, when used in conjunction with NEI 08-08A, provides acceptable templates for assuring that the process and effluent monitoring and sampling, and ground water protection programs meet applicable NRC regulations and guidance. NEI 07-09A and NEI 08-08A describe programs that will be implemented in stages, as specified in FSAR section 13.4.

The NRC staff's Safety Evaluation Reports (SERs) associated with NEI technical reports provide the bases for the use of the referenced templates to describe acceptable operational programs which conform to the applicable regulatory guidance documents. For those licensees that elect to demonstrate compliance with the programmatic requirements of 10 CFR 50.36a, 10 CFR 50, Appendix I and 10 CFR 52.79(a)(16) or 10 CFR 20.1406 via alternate methods, SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Without Inspections, Tests, Analyses, and Acceptance Criteria [ITAAC]" notes that in the absence of ITAAC, "fully described" is understood to mean that the program is clearly and sufficiently described. For the purposes of this inspection, the program is consistent with the description provided in the FSAR. The FSAR program description may contain a full description of the program consistent with SECY-04-0032, or may incorporate the NEI Templates and required supplemental information.

Where available, use system walk downs and observations of system operation to supplement the programmatic review when completing this procedure.

02.01 Determine the status of the operational programs for Permanently Installed and Mobile Systems

Inspection Requirement(s):

- a. Confirm that the description of liquid waste processing system(s) provided in program documents are consistent with the description of the permanently installed liquid waste processing system (LWPS) and mobile/temporary liquid waste processing system (MLWPS) used for routine (i.e., in the facility for greater than 90 days), processing of liquid radioactive wastes described in the FSAR, and reflect the actual facilities provided. Where available, select at least one LWPS and at least one MLWPS for inspection.

Inspection Guidance: The FSAR provides the basis for the systems described in facility operating programs and procedures. The licensee programs implement the commitments described in the FSAR, Combined License (COL) Information items, the programmatic commitments related to the LWMS specified in the FSAR, and the regulatory commitments specified in FSAR Chapter 1. The FSAR for some designs may provide space for the future use of MLWPSs that may require additional review and analysis before the licensees may implement routine use of the MLWPS.

- b. Evaluate the program description and procedures describing the functionality and effectiveness of the LWMS in controlling and monitoring process streams and effluents. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet the functional requirements. Where available, select at least one LWPS and at least one MLWPS for inspection.

Inspection Guidance:

1. The program documents describe the type, quantity, capacities and processing rates of components and systems, including discharge and recirculation/mixing pumps, valves, strainers and filters, ion-exchange and charcoal beds, tankage, etc., needed to obtain the specified effluent activity concentrations, and automatic control features or interlocks in diverting or terminating releases.
 2. The program description of process input streams to the LWMS is consistent with those described in the FSAR. The program contains instructions on how to evaluate new input streams or input streams with radioactivity or chemical characteristics other than those assumed in the FSAR, and the potential impact on the LWMS (e.g., reduced process efficiency, preferential release of radionuclides from media, increased waste media generation, degradation of the media, exothermic reactions or explosive gas generation. See Information Notice (IN) 83-14, IN 84-72 and IN 88-08 and the potential impact on effluent doses or the volume of stored waste.
 3. The program describes the criteria and methods for determining the types, quantity, and specifications of filters, charcoal adsorbent media, ion-exchange resins, reverse osmosis units, etc., needed to obtain the specified effluent activity concentrations.
 4. The program describes the criteria and methods for determining the specifications for ion-exchange resins to ensure that gas generation rates remain within the assumptions of the fire hazards analysis (see NUREG/CR-4601).
 5. The licensee program documents describe the features of LWPS and MLWPS provided to minimize contamination of the facility, minimize contamination of the environment and to facilitate decommissioning of the facility.
- c. Evaluate the program description and procedures describing the operation of the LWMS. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet the operational requirements. Where available, select at least two components from the LWPS and at least two components from the MLWPS for inspection.

Inspection Guidance:

1. Proper operation of features used to ensure that interconnections between permanently installed plant systems and mobile processing equipment will avoid (i) the contamination of non-radioactive systems, (ii) uncontrolled and unmonitored releases of radioactive materials to the environment. See guidance given in NUREG-0800 Standard Review Plan (SRP) Section 9.2.4, IE Bulletin No. 80-10, and IE Circulars 77-14 and 79-21.
2. Proper operation of features provided to reduce maintenance, equipment downtime, leakage of liquid waste or discharge of radioactive material in liquid effluents, and to control the venting or purging of radioactive materials to ambient building atmospheres (e.g., controlling pressure to pump mechanical seals, and filling and venting filters etc.) can reduce operational radiation exposure (ORE) and prevent degradation of LWMS performance.
3. Proper operation of features provided to meet the requirements of 10 CFR 20.1406 (e.g., process system flow, level and pressure) to prevent water hammer pressure transients, tank over flows and component damage that cause contamination of the facility and the environment and complicate facilitate facility decommissioning.
4. Proper operation of system controls used to initiate automatic termination of treatment processes, venting and purging, termination of liquid radioactive waste releases to the environment, and help to ensure LWMS integrity and prevent inadvertent or unanalyzed releases (e.g., resin extrusions due to over pressure transients etc.) of radioactive material to the facility or the environment.
5. Proper operation of features provided to accommodate fluctuations in process and liquid waste flow rates (e.g., level switches and valves used for automatic tank transfers, resin tank level controllers) which may prevent equipment damage or facility contamination (e.g., tank over flow, excessive filter differential pressure, resin intrusion into clean systems, etc.).
6. Proper operation of features provided for shared or interconnected systems at multi-unit facilities that control or limit total liquid effluent releases from the facility.
7. For sites with licensees operating two or more reactors, each licensee includes in their respective ODCM a process for notifying other licensees on the same site to ensure that, when combined, effluent concentrations and offsite doses and dose rate limits of Part 20 are not exceeded. Licensee processes and procedures describe how the operation of two or more plants contributing to and sharing a single dose allocation for members of the public under 10 CFR Part 20.1301, 20.1302, 20.1301(e) and 40 CFR Part 190, will be maintained within limits for the site. The licensee processes describe the mechanism(s) by which releases of liquid effluents are coordinated and controlled such that all site

Licensees are jointly aware of routine and planned releases, and those associated with AOOs as they occur. The licensee processes for controlling site releases contains formalized documentation from each affected licensee acknowledging the individual licensee's responsibilities and limitations. The processes to be utilized for modifying joint agreements are described by the licensee.

- d. Evaluate the program processes and procedures for maintaining the radioactive material content of the LWMS and the facility housing the LWMS within the facility licensing bases.

Inspection Guidance: The amount of radioactive material allowed to be contained within the LWMS or facilities housing the LWMS may be limited by the classification level of the Systems Structures or Components (SSC) specified in the FSAR (see RG 1.143). Licensees are aware of these potential limitations, and have processes in place to ensure that the facility design bases are not exceeded. Also, radioactive material content of components, such as resin storage tanks that may be limited by decay heat removal considerations, radiolytic degeneration of LWMS components such as seals, filtration media or electronics, or explosive gas generation from purification media.

- e. Evaluate the program and procedures describing the processes for monitoring and controlling the performance of the LWMS. Where available, select at least two performance parameters of the LWPS and at least two performance parameters of the MLWPS.

Inspection Guidance: The Licensee's program describe the process used to establish the system parameters that need to be monitored to ensure LWMS performance is consistent with that assumed in the design bases. Changes in system flow rates, component differential pressures or removal efficiencies are evaluated to ensure the absence of underlying system deficiencies (e.g., changes in system control set points may adversely affect system performance.) Licensee processes for ensuring performance (e.g., radionuclide removal efficiencies or decontamination factors) of adsorbent media used in liquid waste processing and treatment systems that meet or exceed those stated in the FSAR, provide continued assurance that the dose objectives of Appendix I 10 CFR Part 50 for liquid effluents, the dose limits of 10 CFR Part 20.1301, the requirements of 10 CFR Part 20.1302, and the liquid effluent concentration limits of Appendix B (Table 2, Column 2) to 10 CFR Part 20 would be met.

02.02 Maintenance, testing, inspection and service life.

Inspection Requirement(s):

- a. Evaluate the program description and procedures describing maintenance of the LWMS. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet the requirements of the preventive maintenance program. Where available, select at least two components from the permanently installed LWPS and at least two components from the MLWPS.

Inspection Guidance:

1. Proper operation of the LWMS is contingent upon the performance of the relevant types of preventive maintenance at the required frequencies. Consistent with the requirements of 10 CFR 50.36a(a)(1) and 10 CFR 50.34a(c)(1) the licensee is to maintain and use radioactive waste systems. Use of methods recommended by the manufacturer, supplemented by information available as a result of industry experience and standards form the basis for the processes the licensee uses to establish and preserve the required maintenance practices.

Processes are established for evaluating and documenting deviations from the recommended practices for preventive maintenance. Processes are established for monitoring the effect of maintenance, and where necessary, changing the periodicity. Preventive maintenance activities such as checking/replacing pump mechanical seal cooling water supply filters and gas venting filters can reduce ORE and degradation of LWMS performance. Preventive maintenance activities such as checking/lubricating valve linkages can prevent uncontrolled releases of radioactive material.

2. Proper operation of the features of the LWMS provided to minimize contamination of the facility, minimize contamination of the environment and facilitate decommissioning of the facility, require periodic maintenance and inspection. Licensees have processes established for evaluating the continued effectiveness of these features (e.g., maintenance of leakage detection devices for retention ponds, etc.).
- b. Evaluate the program description and procedures describing testing of the LWMS. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet the requirements. Where available, select at least two components from the LWPS and at least two components from the MLWPS.

Inspection Guidance: Proper operation of the LWMS is contingent upon the performance of the relevant types of testing at the required frequencies. Testing recommended by the manufacturer, supplemented by information available as a result of industry experience and standards, form the basis for the processes the licensee uses to establish and preserve the required testing practices. Processes are established for evaluating and documenting deviations from the recommended practices for testing. Processes are establish for monitoring the historic performance of components, and where necessary, changing the testing periodicity. Testing activities such as checking relief valve settings, isolation valve function and operation of tank level control devices can prevent system damage and prevent degradation of LWMS performance (e.g., resin extrusion due to excessive pressure or high level conditions). Testing of components, such as backflow preventers, can prevent cross contamination of plant systems. See guidance given in SRP Section 9.2.4, IE Bulletin No. 8010, and IE Circulars 77-14 and 79-21.

- c. Evaluate the program description and procedures describing monitoring and controlling the service life of LWMS components. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet service life requirements. Where available, select at least two components from the LWPS and at least two components from the MLWPS.

Inspection Guidance: Proper operation of the LWMS is contingent upon ensuring that components are operated within allowable service durations. Establishing requirements based on manufacturer recommendations, supplemented by information available as a result of industry experience and standards, form the basis for the processes the licensee uses to establish and preserve the operational integrity and service life for components and consumable media during storage.

Processes are established for evaluating and documenting deviations from the recommended service life. Processes are established for monitoring the actual service life of components, and where necessary, changing the storage and operating conditions or the allowable service duration. Components, such as backflow preventers, diaphragm valves and flexible metal hoses have service life limitations. These service life limitations may be adversely impacted by storage and operating conditions (e.g., minimum bend radius, operating temperature curves, chemical exposure limitations etc.). See guidance given in industry documents such as the Electric Power Research Institute (EPRI) Report 1014800 "Plant Support Engineering: Elastomer Handbook for Nuclear Power Plants." Exceeding service limits, such as minimum bend radius or maximum operating temperature, may result in premature catastrophic failure of hoses. Exceeding service/storage limitations on valve diaphragms may result in failure of the valve to operate when required, leakage through the valve resulting in hot spots, or leaks out of the valve that cause facility or environmental damage. Exceeding service life limitations on components such as pond or tank dike liners may result in tears or punctures that cause environmental contamination. Exceeding the service life on components used to minimize the spread of contamination (e.g., rubber and synthetic seals) may result in increased contamination of the facility or the environment and complicate facility decommissioning.

- d. Evaluate the program description and procedures describing monitoring and controlling the inspection of LWMS components. The evaluation considers how the program documents capture and evaluate the bases and methods used to meet the monitoring and inspection requirements. Where available, select at least two components from the LWPS and at least two components from the MLWPS.

Inspection Guidance: Proper operation of the LWMS is contingent upon the performance of the types of inspections at the required frequencies. Establishing requirements based on manufacturer recommendations, supplemented by information available as a result of industry experience and standards, form the basis for the processes the licensee uses to establish component inspection frequencies. Processes are established for evaluating and documenting deviations from the recommended practices for inspections. Processes are established for monitoring the adequacy of inspections of components, and where necessary, changing the inspection frequencies. Minimization of contamination of the facility or the environment is assured by the performance of inspections of sump and moat

coatings and lining materials, that can detect and effect repairs at an early stage. Where the licensee utilizes penetration seals to minimize contamination of the environment (e.g., a seal around an embedded pipe entering a building sump) processes are established to ascertain the condition of the seals. Inspections for corrosion due to caustic materials used in the purification media or the process fluid (e.g., boric acid) can maintain system integrity and extend equipment life.

02.03 Liquid Sampling.

Determine the adequacy of processes for operating primary coolant process and effluent liquid sampling systems for normal operations and AOOs. Determine the adequacy of procedures for sampling primary coolant (post-accident sampling system), process liquids, and liquid effluents under accident conditions.

Inspection Requirement(s):

- a. Confirm that procedures for operating sampling systems for process system liquids, and liquid wastes include the use of design features identified in the FSAR, and experienced gained from the operating industry. Select at least two sample points from the LWMS and at least two sample points from the Plant Process Sampling System.

Inspection Guidance: The program includes procedures for the operation of ventilation systems that assures that sample collection points remain properly ventilated during normal, AOO and accident conditions. The program addresses sample system ventilation during normally expected ventilation system configurations and routine ventilation system maintenance (e.g., ventilation system filter changes or fan lubrications). The program identifies and describes the use of special tools (e.g., quick disconnects, sample handling tools) or equipment. The program identifies and describes the use of features provided to reduce ORE (e.g., the maximum allowable sample stream flow rates to prevent exposure to N-16 radiation) and processes to reduce source term build-up (e.g., post sample flushing).

- b. Confirm that testing and maintenance procedures of systems for sampling process liquids and liquid waste include the use of design features identified in the FSAR and experienced gained from the operating industry. Select at least two sample points from the LWMS and at least two sample points from the Plant Process Sampling System.

Inspection Guidance: The program describes the processes for determining required sample hood flow rates, and how the minimum flow rates are maintained. The program identifies and describes the maintenance of features provided to reduce ORE (e.g., use of flushable sampling and monitoring components) to reduce source term build-up. The program describes the types and periodicities of testing and maintenance required to ensure the function of the sampling system (e.g., testing of sample line heat trace circuits, testing of interlocks).

- c. Evaluate the adequacy of procedures and processes for obtaining routine grab samples, from the LWMS and other plant process fluid streams. Select at least two sample points from the LWMS and at least two sample points from the Plant Process Sampling System.

Inspection Guidance: The program and procedures describe the processes for obtaining local grab samples from non-radioactive systems that may be subject to radiological contamination (e.g., service water, demineralized water, auxiliary boiler water, and potable water) and components such as collection tanks. Licensee processes and procedures describe the methods for the control and operation of sample stations that reduce leakage and spillage, prevent the introduction of chemicals to the LWMS that may degrade media performance, and reduce ORE due to sampling. Procedures address the use of provisions to purge and drain sample lines back to the system of origin or to an appropriate waste treatment system.

- d. Evaluate the adequacy of the program for ensuring representative sampling. Select at least two sample points from the LWMS and at least two sample points from the Plant Process Sampling System.

Inspection Guidance: The program describes the processes to ensure manual and process samples are representative of process system fluids. The program contains provisions for evaluating or addressing mixtures, composited samples, sparging, recirculation, line deposition, flow or crud traps, radiation monitor sensitivities changes related to decay or delay in flow reaching monitors or sample points, and how these factors affect set point selection and calibrations. For batch releases, procedures for tank recirculation specifies a recirculation rate of not less than two-tank volumes per 8 hours, unless otherwise stated in FSAR design basis.

- e. Review the adequacy of the program for identifying sample points and establishing sampling frequencies. Select at least two sample points from the LWMS and at least two sample points from the Plant Process Sampling System.

Inspection Guidance: The program describes the process for determining LWMS and plant sampling points, and the required sampling frequency. The basis for selection of the sample points are described (e.g., from the FSAR, from the EPRI Primary Water or Secondary Water Chemistry Guidelines but not specified in the FSAR; monitoring of the performance of LWMS filters and demineralizers, etc.) The basis for the assigned sampling frequency for each identified sample point are described. The licensee's program describes the methods for identifying the appropriate sampling techniques (e.g., continuous proportional sampling, automatic grab sampling, and sample flow ratios) and the associated monitoring processes, to ensure that samples of effluent streams are representative.

- f. Review the processes and procedures for sampling process streams and effluents under accident conditions to determine that they will provide representative samples and assure adequate radiation protection for personnel taking and analyzing samples. Select at least two sample points used to analyze post-accident fluids.

Inspection Guidance: Using the applicable guidance in RGs 1.97 and 1.101, NUREG-0737, Items II.B.2 and II.B.3, SRP Section 9.3.2, and the licensee's Emergency Plan and Implementation Procedures, the reviewer ensures that:

The licensee's implementation procedures for sampling addresses provisions for:

- Purging sample lines.
- Minimizing sample loss or distortion in sample chemical and physical composition.
- Preventing blockage of sample lines.
- Appropriately disposing of samples.
- Ensuring the effectiveness of ventilation exhaust from sampling stations
- Ensuring that samples are representative of reactor primary coolant, reactor steam, secondary coolant, secondary steam, or system sample streams.

If inline sample monitoring instruments are used, the licensee procedures identify the processes for obtaining backup grab samples. The licensee's programs and procedures should describe the methods for evaluating shielding provisions at sampling stations which are considered vital areas. The licensee's programs and procedures describe the processes for taking, handling, packaging, and transporting samples safely from the sampling stations to designated location(s) for analysis. Note: Inspection guidance concerning laboratory analyses is described in other sections of the Inspection Manual.

- g. Evaluate the methods used to assess how potential radioactive release paths from normally non-radioactive systems are to be identified, monitored and/or sampled (IE Bulletin No. 80-10). Select at least two non-radioactive SSCs that, based on operational experience, may become contaminated.

Inspection Guidance: The licensee's programs describe the processes for identifying non-radiological systems that may be subject to radiological contamination. Procedures describe methods to avoid the contamination of non-radioactive systems and prevent uncontrolled and unmonitored releases of radioactive materials to the environment. Procedures are established for evaluating the regulatory implications, reporting requirements, license conditions, and acceptability of continued operation with radioactive leakage into non-radioactive systems. The licensee procedures address minimizing contamination of the facility and environment and minimizing decommissioning cost, when there is a determination that continued system operation with radioactive leakage into non-radioactive systems is required.

02.04 Pre-Operational Testing Program.

Determine whether the pre-operational testing program for the LWMS is adequate. Determine how the results of the pre-operational test program were evaluated and used to adjust the operational program, and operational testing program.

Inspection Requirement(s):

- a. Review the licensee testing program for the LWMS, including LWPS and MLWPS expected to be used for routine processing, as described in the FSAR. Where available, select at least two tests of the LWPS and at least two tests of the MLWPS.

Inspection Guidance: The licensee's pre-operational test program for LWMS includes requirements and the bases for:

1. The test procedures for each portion of the LWMS described in the FSAR.
 2. Test requirements, prerequisites, and acceptance criteria.
 3. Testing the functionality of provisions for flushing or purging of sample lines, decontamination of sampling components, wiring checks, mechanical and operational integrity, automatic control features and interlocks, and leak tightness tests.
 4. Test requirements for temporary connections between mobile processing and temporary treatment systems and permanently installed plant systems.
 5. Requirements for initial operational performance tests and calibration of instrumentation before implementing the testing of the LWMS.
 6. Test requirements for MLWPS expected to be used for routine processing.
 7. Testing that verifies the ability of the LWMS to obtain the required set points (e.g., detection limits).
- b. Evaluate the effectiveness of the licensee's program covering the review and evaluation of pre-operational test results and incorporation of those results into operational programs. Where available, select at least one test result of the LWPS and at least one test result of the MLWPS.

Inspection Guidance: The licensee's processes for evaluating the pre-operational test program for LWMS identifies:

1. Processes for identifying and incorporating relevant system performance (i.e., system performance that was below that expected in the design) information into the operating program and operational maintenance programs.
2. Processes for using the corrective action program for identification, tracking and resolution of system operation problems, including any required system alterations, identified as a result of the pre-operational test program.

02.05 Process and Effluent Radiation Monitors and Instrumentation.

Determine the adequacy of the program for operation, calibration, and testing of process and effluent radiological sampling and monitoring instrumentation for the LWMS. These considerations may be addressed in other inspection areas, such as technical specifications (TS), the ODCM, the Radiological Environmental Monitoring Program (REMP), and inspection of certain preoperational tests. Care should be exercised both to avoid redundant inspections and to ensure adequate evaluation of issues not inspected in other program areas, but which also affect liquid waste management.

Inspection Requirement(s):

- a. Determine that the program captures the calibration requirements that are included in the plant's TS under 10 CFR Part 50.36a using the guidance provided in RGs 1.21, 1.33, 1.105 and 4.15. Select at least two instruments from the LWMS and at least two instruments from the radiation monitoring system.

Inspection Guidance: Consistent with the requirements of 10 CFR 50.36a(a)(1) and 10 CFR 50.34a(c)(1) the licensee is to maintain and use radioactive waste systems. The licensee programs describe the processes used to establish calibration requirements and frequencies. The guidance contained in RG 1.105 "Set points for Safety-Related Instrumentation" is used to establish calibration frequencies for safety related instruments. The licensee describes the bases, including relevant industry standards, for establishing the calibration of non-safety related systems. Processes are established for monitoring the effectiveness of calibration frequency, and where necessary, changing the periodicity. The program describes the processes to be followed when as found instrument parameters are outside of acceptable bounds. The program describes the processes to be used to establish allowable minimum and maximum instrument parameters (e.g., limitations on detector applied High Voltage). The instruments of primary interest are the points of discharge related control instruments and radiation monitoring instruments. The program ensures that that instrumentation response characteristics (e.g., dynamic response ranges, sensitivity levels, and lower limits of detection) are consistent with plant-derived radionuclide distributions expected during normal operation, AOOs, and accident conditions. The program describes the process for establishing calibration methods, evaluating response characteristics, establishing radionuclide mixes for calibration sources, and documenting traceability of calibration standards and sources.

- b. Evaluate the program description of the processes and procedures used in obtaining and analyzing samples of fluid and ventilation systems following an accident. Select at least one parameter requiring a sample following an accident.

Inspection Guidance: If TS address post-accident sampling, then ensure that the licensee's processes and procedures correctly implement TS requirements. If TS do not address post-accident sampling, refer instead to: Notice of Availability for Referencing in License Amendment Applications Model Safety Evaluation on Technical

Specification Improvement to Eliminate Requirements on Post Accident Sampling Systems Using the Consolidated Line Item Improvement Process (ADAMS Accession No. ML003750475). If the applicant is using this methodology, then ensure that the program:

1. Maintains contingency plans for obtaining and analyzing highly radioactive samples of reactor coolant, containment sump, and containment atmosphere,
 2. Maintains a capability for classifying fuel damage events at the Alert Level threshold (typically at the 300 micro curie/ml iodine dose equivalent), and
 3. Maintains the capability to monitor radioiodines that have been released to offsite environs.
- c. Evaluate the program description and procedures for determining instrumentation set points. Select at least two instruments from the LWMS and at least two instruments from the radiation monitoring system.

Inspection Guidance: The licensee programs describes the processes used to establish instrumentation set points. The guidance contained in RG 1.105 "Set points for Safety-Related Instrumentation" is used to establish set points for safety related instruments. The licensee describes the bases, including relevant industry standards, for establishing the set points of non-safety related systems. The licensee processes assure continued representative characterization of process and effluent streams with adequate detection capability, sensitivity, operational dynamic response ranges (see plant's technical specifications and American National Standards Institute (ANSI) N42.18-2004), and accessibility under accident conditions. The licensee's processes used to establish set points assures that set points of monitors includes consideration of collection efficiencies for sampling media (e.g., resin or filtering media), sampling line losses, corrections for decay or dilution during transit. The processes for determining instrument set points includes consideration of instrument capabilities and limitations, such as detection limits under expected operational conditions (i.e., background effects during normal operation, AOOs or accident, as appropriate to the instrument function), range limitations and proximity to instrument transition points (e.g., detector or scale switching points). The licensee's processes identify and address the potential impact of variation of sampling parameters (e.g., changes in density/pressure of sampled fluid due to local fluid/gas space changes or changes in pressure differential across system components).

- d. Evaluate the program description and procedures used to identify, assess and ensure that required functional tests are performed. Select at least two instruments from the radiation monitoring system.

Inspection Guidance: The licensee's program and procedures describe the required functional tests, the required frequency and the bases for the requiring the functional test. The bases may include those recommended by the equipment manufacturer, technical basis documents (e.g. NEI 97-06 uses EPRI Report 1008219

“PWR Primary-to-Secondary Leak Guidelines” to describe the leakage monitoring program elements needed to reliably detect the level and the rate of change of radioactivity in the secondary plant.), and industry operating experience. Functional test(s) are identified for all monitoring systems including tests of alarms, set points, operational functional checks using check sources and electronic signals, and auto isolation initiated by trips of alarm set points.

- e. Evaluate the program description and procedures used to enter and control parameters of electronic instruments, programmable logic controllers, and computer systems. Select at least two instruments from the LWMS and at least two instruments from the radiation monitoring system.

Inspection Guidance: The licensee’s program and procedures describe the methods for identifying controllers, instruments and digital processing systems (e.g., computers) used for the LWMS or the radiation monitoring system that may contain programmable electronic parameters (within software and firmware) that could affect the operation or response of the device or system. The licensee’s programs and procedures describe the method for specifying, setting and verifying these parameters. The licensee’s processes address settings and control of these parameters prior to initial operation, for calibration or testing and prior to returning to service following maintenance or testing. The inspection reviews and evaluates calibration and other documentation (e.g., system software validation and verification packages) provided by the manufacturer or developed by the licensee and confirms that such information is current with instrumentation system software and firmware upgrades. Particular attention should be given to those sampling and monitoring systems not specifically identified in TS (e.g. mobile or temporary processing systems and components, or effluent controls).

- f. Evaluate the program description and procedures used to periodically verify continued operability of liquid process and effluent monitors described in the FSAR. Select at least two instruments from the radiation monitoring system.

Inspection Guidance: The licensee’s program and procedures describe the programs and procedures used to periodically verify the continued operability of radiation monitoring equipment (e.g. sampling flow rates, acceptable differential pressures, local and remote alarms, local and remote control panels, built-in check sources, etc.) A list of monitors typically required is included in SRP Section 11.5. The licensee’s processes address the performance and service life of sample media (e.g., filter loading, charcoal saturation, etc.). The licensee processes for assessing media performance, address the adverse impact of potential contaminants (e.g., volatile organic compounds or high humidity impacts on charcoal sample media, or dust loading on filter media), would provide continued assurance that the dose objectives of Appendix I 10 CFR Part 50 for liquid effluents, the dose limits of 10 CFR Part 20.1301, the requirements of 10 CFR Part 20.1302, and the liquid effluent concentration limits of Appendix B (Table 2, Column 2) to 10 CFR Part 20 would be met.

02.06 Design and Configuration control.

Inspection Requirement(s):

- a. Evaluate any changes to the LWMS, including the use of mobile waste processing equipment, to ensure that the 10 CFR Part 50.59 evaluation performed in support of the changes demonstrates that the change does not alter the technical and regulatory commitments of the FSAR. Where available, select at least one change evaluation for the permanently installed LWPS and at least one change evaluation for the mobile/temporary MLWPS.

Inspection Guidance: The FSAR provides the licensing bases for the systems described in facility operating programs and procedures. The licensee programs implement the commitments described in the FSAR Combined License Information items, the programmatic commitments related to the LWMS specified in the FSAR, and the regulatory commitments specified in FSAR Chapter 1 (e.g., RG 1.143). The FSAR for some designs may provide space for the future use of MLWPSs. Consistent with the guidance provided in RG 1.187, and the endorsed NEI report 96-07, alterations to the facility in place longer than 90 days should be evaluated utilizing the process described in 10 CFR 50.59 and IE Circular 80-18. The 10 CFR 50.59 evaluation performed for the long term use of these types of systems address the regulatory bases for waste systems described in FSAR chapter 1.

- b. Confirm that the program ensures routine use of an added MLWPS is evaluated using the licensing bases source terms described in the FSAR. Where available, evaluate at least one mobile/temporary liquid waste processing system (MLWPS).

Inspection Guidance: Using the licensing bases described in the FSAR for the LWPS to address the routine use of temporary or mobile processing SSCs ensures that proper radiation shielding and ventilation is available to protect plant personnel during operation and maintenance. To ensure that individual and collective occupational exposures, from permanent and mobile LWMS components, are ALARA, MLWPS to be used for routine processing of liquid radioactive waste, are capable of meeting the radiological protection criteria for shielding and ventilation relevant to the LWPS, using the design bases fission product source terms specified in FSAR section 12.2. Licensee processes ensure that where a MLWPS is to be routinely used, the RG 1.143 classification of the facility housing the MLWPS reflects total radionuclide inventory, including that expected in the MLWPS. The licensee's processes ensure that maximum radionuclide inventories within the SSCs housing all LWMS components remain within the licensing bases assumptions utilized to characterize the facility (see RG 1.143). The licensee processes identify the physical and operational interfaces between mobile subsystems and permanently installed plant systems. Guidance can be found in RGs 8.8, 1.143 and ANSI/ANS-N55.6-1992 (reaffirmed 1999).

- c. Confirm that the program ensures the appropriate Quality Assurance (QA) requirements are utilized during operation, maintenance, and modification of the LWMS. Evaluate at least one LWMS system.

Inspection Guidance: The licensee's program describes QA requirements consistent with their licensing bases governing the design, fabrication, procurement, construction, and installation, and initial testing of mobile liquid waste management systems and components, consistent with the licensee's QA program, guidance of RGs 1.21, 1.33, 1.143, and 4.15, and SRP Section 17.5 and to the extent of control required by Appendix B to 10 CFR Part 50.

02.07 Content and Quality of Programs, Plans, and Procedures.

Inspection Requirement(s):

- a. Confirm that the licensee's program description includes the types of procedures required by their licensing bases. Evaluate the program description of the LWMS system and Radiation Monitoring system.

Inspection Guidance: The licensee's program includes the relevant procedures listed in Appendix A of RG 1.33; these procedures are required by technical specifications and other NRC guidance documents.

- b. Confirm that the licensee/applicant has an approved ODCM describing the plant's standard radiological effluent controls (SREC). Examine the ODCM.

Inspection Guidance: The licensee's program fully describes the ODCM, and the bases for the ODCM. The licensee's program describes the method for implementing the ODCM, as described in the FSAR, was implemented. Where the FSAR committed to implementing the NEI-07-09A "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description," (ADAMS Accession no. ML091050234), template, the licensee's program documents describe how licensee specific information required by the template was identified and incorporated into the ODCM. The ODCM contains instructions on how liquid effluent releases will be monitored, sampled, and analyzed with the results used to establish instrumentation parameters in setting alarm set points to control or terminate effluent releases at concentrations established for dissolved and entrained noble gases and provisions for instantaneous releases conforming to 10 times the limits of 10 CFR Part 20, Appendix B, effluent concentration limits (Table 2, Column 2) in unrestricted areas. Guidance on the development of the ODCM and implementing procedures is contained in NUREG-1301 (PWRs) or NUREG-1302 (BWRs), and NUREG-0133, and NUREG-0543 on compliance with 40 CFR 190, as implemented under 10 CFR Part 20.1301(e).

- c. Confirm that the licensee's program contains the appropriate types and quality of programs, plans, and procedures for normal operations, AOOs, and accident conditions. Select at least one procedure for the radiation monitoring system, and where available, one procedure for the LWPS and one procedure for the MLWPS.

Inspection Guidance: The licensee's procedures for sampling and analysis specify the types of samples to be collected, analyses to be performed on each sample,

and appropriate sampling and analysis schedules. The required samples and analysis are consistent with those specified in the FSAR, required by commitments (e.g., primary and secondary water chemistry guidelines) required by TS, required to demonstrate compliance with regulations or to assure compliance with the facility design bases. The licensee's program includes procedures for routine calibration and surveillance tests for all instrumentation.

The licensee's program includes procedures for operation of equipment/systems and for response to equipment/system alarms or trips and expected under AOO conditions. The licensee's program includes procedures describing the routine and preventative maintenance program. The licensee's program includes procedures for monitoring and evaluating system performance, including:

1. Periodic evaluations of system operational efficiency.
2. Periodic audits and corrective action process for resolving audit findings.
3. Periodic verification of system operational readiness, as designed.

Licensee procedures clearly define the division of responsibilities and lines of communications among different responsible organizational units (e.g., system operations and management, quality assurance, instrumentation and control, maintenance, radiochemistry, and radiation protection) involved in the operation, calibration, and maintenance of the LWMS and radiation monitoring equipment. Licensee procedures address how performance indicator values are established and evaluated.

- d. Confirm that changes to the licensee's programs and procedures are appropriately evaluated in accordance with 10 Part 50.59, and guidance such as RG 1.143, and staff recommendations given in IE Circular 80-18. Select at least one procedure that has been changed for the radiation monitoring system, where available at least one procedure change for the LWPS and at least one procedure change for the MLWPS, and where available one change to the ODCM.

Inspection Guidance: The licensee's program describes the processes, including the levels of approval and post change requirements for changes to the ODCM, program documents, and operational procedures. Changes to the licensee's procedures are evaluated using the criteria of 10 CFR 50.59, and as specified in the ODCM.

02.08 Definition of Liquid Waste Management System.

As defined in RG 1.143, the LWMS begins at the interface valves in each line from other systems provided for collecting wastes that may contain radioactive materials and to include related instrumentation and control systems. The LWMS terminates at the point of controlled discharge to the environment, at the point of recycle to the primary or secondary water system storage tanks, or at the point of packaged solid wastes. The LWMS may be permanently installed plant equipment, a mobile liquid waste processing system, or a combination of systems.

84528-03 RESOURCE ESTIMATE

It is estimated that approximately 160 hours of direct inspection effort will be required to implement this procedure. An inspection of LWM will require several individuals, including:

- a. Team Leader
- b. Health Physicist
- c. Subject matter expert(s) (SMEs) in liquid waste management system design and operation. SME should be assigned by subsystem or program being inspected.

It is expected that the actual hours required to complete the inspection may vary from this estimate. The inspection hours allocated for this inspection are an estimate for budgeting purposes. The hours expended during an inspection should be tailored taking into account plant specific design features and operational programs. The level of effort expended in such inspections should be recorded for the purpose of planning future inspections and updating budget allocations.

84528-04 REFERENCES

10 CFR 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents at Nuclear Power Reactors."

10 CFR 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors."

10 CFR 50.59, "Changes, Tests, and Experiments."

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."

10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

10 CFR Part 20, "Standards for Protection Against Radiation."

10 CFR Part 20.1406, "Minimization of Contamination."

Generic Letter 89-01, "Implementation of Programmatic and Procedural Controls for Radiological Effluent Technical Specifications," January 1989.

IE Bulletin No. 80 10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment," May 6, 1980.

IE Circular No. 77 10, "Vacuum Conditions Resulting in Damage to Liquid Process Tanks," July 15, 1977.

IE Circular No. 77 14, "Separation of Contaminated Water Systems from Noncontaminated Plant Systems," November 22, 1977.

IE Circular No. 79 21, "Prevention of Unplanned Releases of Radioactivity," October 19, 1979.

IE Circular No. 80 18, "10 CFR 50.59 Safety Evaluations for Changes to Radioactive Waste Treatment Systems," August 22, 1980.

IE Circular No. 81 09, "Containment Effluent Water that Bypasses Radioactivity Monitor," July 10, 1981.

IE Information Notice No. 79 07, "Rupture of Radwaste Tanks," March 23, 1979.

IE Information Notice No. 79 09, "Spill of Radioactively Contaminated Resin," March 30, 1979.

Information Notice (IN) 2005-24, "Nonconservatism in Leakage Detection Sensitivity" (ADAMS Accession No. ML051780073)

Liquid Radioactive Release Lessons Learned Task Force Report, September 1, 2006 (ADAMS Accession No. ML062650312).

Notice of Availability for Referencing in License Amendment Applications Model Safety Evaluation on Technical Specification Improvement to Eliminate Requirements on Post Accident Sampling Systems Using the Consolidated Line Item Improvement Process (ADAMS ML003750475).

NRC Branch Technical Position (BTP) 7-12 "Guidance on Establishing and Maintaining Instrument Set points" Revision 5 (ADAMS Accession No. ML070550078).

NUREG 0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants."

NUREG-0543, "Methods for Demonstrating LWR Compliance with the EPA Uranium Fuel Cycle Standard (40 CFR Part 190)."

NUREG 0737, "Clarification of TMI Action Plan Requirements," November 1980.

NUREG-0800 Standard Review Plan Section 9.2.4, "Potable and Sanitary Water Systems."

NUREG-0800 Standard Review Plan Section 9.3.2, "Process and Post Accident Sampling Systems."

NUREG-0800 Standard Review Plan Section 11.2, "Liquid Waste Management Systems."

NUREG-0800 Standard Review Plan Section 11.5, "Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems."

NUREG-0800 Standard Review Plan Section 17.5, "Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants."

NUREG 1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors." (With Generic Letter 89-01, Supplement 1) (ADAMS Accession No. ML031290465).

NUREG 1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors." (With Generic Letter 89-01, Supplement 1) (ADAMS Accession No. ML031290469).

NUREG/CR-4601, "Technical Considerations Affecting Preparation of Ion-Exchange Resins for Disposal," (ADAMS Accession No. ML13109A068).

Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light Water Cooled Nuclear Power Plants."

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

Regulatory Guide 1.68, "Initial Test Programs for Water Cooled Nuclear Power Plants."

Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."

Regulatory Guide 1.101, "Emergency Response Planning and Preparedness for Nuclear Power Reactors."

Regulatory Guide 1.105 "Set points for Safety-Related Instrumentation."

Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light Water Cooled Nuclear Reactor Power Plants."

Regulatory Guide 1.187, "Guidance for Implementation of 10 CFR 50.59, Changes, Tests, and Experiments."

Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation) Effluent Streams and the Environment."

Regulatory Guide 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning." (ADAMS Accession No. ML080500187).

Regulatory Guide 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable."

Regulatory Issue Summary (RIS) 09-02 Revision 1 "Use of Containment Atmosphere Gaseous Radioactivity Monitors as Reactor Coolant System Leakage Detection Equipment at Nuclear Power Reactors," (ADAMS Accession No. ML090850574).

RIS 2001-25 NEI 99-02, Revision 2, "Voluntary Submission of Performance Indicator Data"

SRM-SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License without Inspections, Tests, Analyses, and Acceptance Criteria." May 2004.

USNRC Information Notice 83-014, "Dewatered Spent Ion Exchange Resin Susceptibility to Exothermic Chemical Reaction," March 1983.

USNRC Information Notice 84-072, "Clarification of Conditions for Waste Shipments Subject To Hydrogen Gas Generation," September 1984.

USNRC Information Notice 88-008, "Chemical Reactions with Radioactive Waste Solidification Agents," March 1988.

USNRC Information Notice 93-56, "Weakness in Emergency Operating Procedures Found as a Result of Steam Generator Tube Rupture" (ADAMS Accession No. ML0310702800).

USNRC Information Notice 94-43, "Determination of Primary-to-Secondary Steam Generator Leak Rate," (ADAMS Accession No. ML0310700100).

ANSI N42.18 2004 (Reaffirmation of ANSI N42.18-1980) (Redesignation of ANSI N13.10 1974), "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."¹

ANSI/ANS N55.6 1993 (R2007), "Liquid Radioactive Waste Processing System for Light Water Reactor Plants." (Reaffirmed 2007.)²

Nuclear Energy Institute NEI 99-02 Revision 6 "Regulatory Assessment Performance Indicator Guideline" (ADAMS Accession No. ML092931123) [or the latest NEI approved revision].

NEI-07-09A "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description", (ADAMS Accession No. ML091050234).

Nuclear Energy Institute NEI-08-08A Rev 0 "Guidance for Life Cycle Minimization of Contamination", October 2009, (ADAMS Accession No. ML093480532).

Nuclear Energy Institute NEI 96-07, "Guidelines for 10 CFR 50.59 Evaluations," (ADAMS Accession No. ML003771157).

Nuclear Energy Institute NEI 97-06, "Steam Generator Program Guidelines" (ADAMS Accession No. ML052710007 for revision 2, or current version)

¹ Copies of this document may be purchased from the American National Standards Institute (ANSI), 1819 L Street, NW., 6th floor, Washington, DC 20036 [phone: (202) 293-8020]. Purchase information is available through the ANSI Web site at <http://webstore.ansi.org/ansidocstore>.

² Copies of this document may be purchased from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60526 [phone: 800-323-3044] <http://www.new.ans.org/>

84528-05 PROCEDURE COMPLETION

Inspection of the minimum sample size will constitute completion of this procedure. The minimum sample size for this procedure is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed verifying the inspection objectives have been met. Completion of the inspection must demonstrate that the program can be inspected under the ROP.

END

Attachment:
Revision History for IP 84528

³ Available from the Electric Power Research Institute at <http://www.epri.com/>

Attachment 1 - Revision History for Inspection Procedure 84528
Part 52, Liquid Waste Management Program

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number (Pre-Decisional, Non-Public)
N/A	ML14311A137 10/19/16 CN 16-027	Initial issue to support inspections of operational programs described in IMC 2504, Construction Inspection Program Inspection of Construction and Operational Programs.	N/A	ML14311A138