UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF NEW REACTORS
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555-001

April 15, 2015

NRC INFORMATION NOTICE 2013-13, REV. 1: DEFICIENCIES WITH EFFLUENT RADIATION MONITORING SYSTEM INSTRUMENTATION

ADDRESSEES

All holders of and applicants for operating licenses or a construction permit for a nuclear power reactor or a non-power reactor under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," including those that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

All holders of and applicants for a power reactor early site permit, combined license, standard design certification, or a manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

All holders of and applicants for a materials license, certificate, approval, or registration, including those holders of and applicants for a specific source material license under 10 CFR Part 40, "Domestic Licensing of Source Material," including licensees involved with uranium recovery (extraction) methods (e.g., in situ recovery facilities, conventional uranium mills, and heap leach and ion-exchange facilities).

All holders of and applicants for a uranium enrichment facility license under 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material."

All holders of and applicants for an independent spent fuel storage installation license under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."

All holders of and applicants for a gaseous diffusion plant certificate of compliance or an approved compliance plan under 10 CFR Part 76, "Certification of Gaseous Diffusion Plants."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this revised information notice (IN) to inform addressees of operating experience with radioactive effluent monitoring systems. This Revision 1 to IN 2013-13 replaces the original IN 2013-13 in its entirety, and clarifies the scope of the monitoring program set up by licensees pursuant to 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants" (hereafter referred to as

ML14253A270

the maintenance rule). Specifically, the revision clarifies that the scope of the maintenance rule monitoring program includes only those radiation monitoring systems (RMSs) that are relied upon to mitigate accidents or transients or are used in plant emergency operating procedures (EOPs) as specified in the rule, instead of all RMSs that may be used in the emergency plan.

The NRC reviewed the operating experience with RMSs based on inspection results and found a broad range of effluent monitoring system deficiencies. The review found problems that occurred with RMS design modifications, calibration, representative sampling, and maintenance. These deficiencies impaired the ability of radioactive effluent monitoring systems to monitor radioactive effluent discharges adequately; however, none of the deficiencies identified resulted in any significant occupational or public dose.

Recipients may review the information for applicability to their facilities and to consider actions, as appropriate, to avoid similar problems. Although these examples concern nuclear power plants, the issues raised in these examples may apply to other licensees that have radioactive effluent monitoring programs. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response to this IN is required.

DESCRIPTION OF CIRCUMSTANCES

The NRC staff reviewed industry operating experience for the period 2007 through 2012 and found 27 instances at 20 nuclear power plants in which the effectiveness of an RMS was degraded enough to warrant an NRC inspection finding or violation. Of particular concern was an apparent increase in the frequency of these instances over the period. The NRC staff evaluated these events and grouped them into the following several categories based on the program, organization, or process affected:

- design (design changes, modifications, alterations) that impaired the system;
- calibrations and checks (primary, secondary, operability tests, etc.) that were not technically correct;
- effluent sampling that was not representative of the effluent stream;
- backup RMSs and alternate sampling were not readily available;
- material condition of system was not maintained;
- quality assurance and quality control were deficient;
- maintenance rule was not carried out for nuclear power plants; and
- emergency planning for power plants was affected.

Example events from each of these categories are summarized below.

Shearon Harris—Design—Configuration Change Eliminates Isokinetic Sampling

In 2008, NRC staff found that the licensee did not adequately survey radioactive materials released through the plant vent stack. Specifically, in 2000 the licensee abandoned a plant vent stack particulate sample line booster pump because of repeated maintenance problems. As a result, sample line isokinetic conditions (i.e., those conditions required to ensure representative sampling of radioactive particulates) were no longer maintained. The licensee proceeded with a modification to abandon the booster pump, assuming the plant vent stack high-efficiency particulate air (HEPA) filtration systems would effectively remove large particulates from the flow path upstream of the particulate sampler in the plant vent stack RMS. The licensee did not recognize that particulates from the spent fuel pool filter backwash system were discharged into the vent path downstream of the HEPA filtration system. With isokinetic conditions no longer maintained in the sample line, the ability to collect a representative sample of airborne particulates from the backwash system was degraded. This underestimated the dose to a member of the public by up to 40 percent during periods when the spent fuel pool filter backwash system was being operated. Corrective actions included reestablishing sample line isokinetic conditions and entering this issue into the licensee's corrective action program (CAP). Other information appears in NRC Integrated Inspection Report 05000400/2008005, dated January 29, 2009, Agencywide Documents Access and Management System (ADAMS) Accession No. ML090290280.

Oconee—Design and Material Condition—Moisture in RMS Sample Chamber Impacts RMS Response

In August 2010, NRC staff found that the licensee did not evaluate the operability of the condenser off-gas (COG) RMSs when water was found in the sample line flow sight glass. The licensee initially had identified the accumulation of water in the off-gas RMSs shortly after they were installed in the 1990s. The licensee did not recognize the inoperability of the monitors, even though the detectors were requiring replacement at a much higher frequency than expected because of water in the detection chamber that was damaging the detector's Mylar window. Furthermore, the presence of water in the detection chamber shielded the beta radiation detector, reduced the measuring chamber gas volume, and invalidated quantitative measurements. The licensee entered this issue into its CAP, and corrective actions included draining the detection chamber once per shift. It also developed plans to replace the COG monitors with a different type of detector that is less susceptible to moisture accumulation. Additional information appears in NRC Integrated Inspection Report Nos. 05000269/2011016, 05000270/2011016, and 05000287/2011016, dated June 23, 2011, ADAMS Accession No. ML111751823.

Brunswick—Design and Representative Sampling—Sample Line Tees and Bends Can Impact Representative Sampling

In 2010, NRC staff found that the reactor building vent effluent RMS contained mechanical tee connections and elbows on the inlet side of the particulate sampler, potentially affecting the ability to collect a representative sample. The NRC inspectors determined that the effect of the configuration had not been evaluated for (1) the particle sizes likely to be encountered, (2) the line loss through the sampling line, or (3) the potential effect on public dose estimates. This degraded the ability to monitor radioactive effluents. The licensee entered this issue into its CAP, and corrective actions included completing a sample line deposition study and developing correction factors to be added to effluent release calculations. Additional information appears in

NRC Integrated Inspection Report Nos. 05000325/2010002 and 05000324/2010002, dated April 28, 2010, ADAMS Accession No. ML101180517.

Calvert Cliffs—Design and Representative Sampling—Design of RMS Sampling System Dilutes Sample

In December 2010, NRC staff found that a ventilation system did not maintain the design negative pressure in the material processing facility (MPF), which could allow radioactive material to bypass the RMS and escape the MPF. NRC staff review found that important portions of the system were out of service for seven years, and the associated effluent RMS was out of service for four years. Furthermore, the NRC staff review found that both the initial RMS sample design, as well as the backup effluent sampler, did not supply representative samples of the effluent stream because of sample dilution issues (e.g., deadhead flow from the standby or alternate train). CAP actions included immediate stoppage of all work in the building and completion of the necessary repairs before restarting work in the building. Other information appears in NRC Integrated Inspection Report Nos. 050000317/2010005 and 05000318/2010005, dated January 28, 2011, ADAMS Accession No. ML110280097.

Shearon Harris—Calibrations—Secondary Calibration Source Not Traceable to the Primary Calibration

In 2012, NRC staff found that a radioactive chlorine-36 source, used for secondary calibration of the plant vent stack monitor, was not traceable to the primary calibration. Specifically, when the original secondary source developed a leak and had to be replaced, an inadequate engineering calculation was performed to evaluate the suitability of the new source. The evaluation compared the sources' activities and Mylar thicknesses, but it did not address geometry differences between the two sources (i.e., point source vs. 2.5-centimeter (1-inch) diameter active area). Thus, traceability of the new chlorine-36 source to the National Institute of Standards and Technology traceable primary calibration was not established adequately. The licensee entered this issue into its CAP and evaluated corrective actions and extent of condition. The licensee performed a supplemental evaluation which showed that the geometry differences between the old source and new source had only minimal effect on detector response. Other information appears in NRC Inspection Report No. 05000400/2012003, dated July 26, 2012, ADAMS Accession No. ML12208A231.

Kewaunee—Calibration—Sources Not Appropriate for Secondary Calibration

As part of an event follow-up for LER 2006-010-00, in 2009, NRC staff evaluated and closed an issue involving radioactive sources used for calibration of effluent RMSs. The secondary calibration sources used for the liquid radioactive waste RMS and the steam generator blowdown liquid RMS were not of sufficient strength to meet channel calibration requirements of the Offsite Dose Calculation Manual (ODCM) and technical specifications (TS). Subsequent testing, with sources of sufficient strength, determined that one of the instruments did not perform as predicted in the range in which the alarm was required, thus rendering the instrument inoperable. The licensee entered this into its CAP. The licensee immediately declared the instrument inoperable and began the required compensatory sampling. Other maintenance corrected the condition, and subsequent secondary calibrations were appropriately completed. Other information appears in NRC Integrated Inspection Report No. 05000305/2009003, dated August 5, 2009, ADAMS Accession No. ML092180061.

Prairie Island—Maintenance—RMSs Not Scoped in the Maintenance Rule

Per 10 CFR 50.65(b)(2)(i), the scope of the maintenance rule includes nonsafety-related structures, systems, and components that are relied upon to mitigate accidents or transients or are used in the EOPs. On September 30, 2011, NRC staff found that the licensee failed to include all plant RMSs used in the EOPs. In addition, the licensee was not demonstrating that the performance or the condition of these RMSs was being controlled effectively through the performance of preventive maintenance. As a result, the performance of some RMSs was not being assessed against licensee-established goals to offer reasonable assurance that the monitors were capable of fulfilling their intended functions. Without the appropriate monitoring and maintenance priority, RMSs may remain out of service for long periods of time. The licensee entered this into its CAP. Corrective actions included scoping the applicable RMSs into the licensee's maintenance rule program. Other information appears in NRC Integrated Inspection Report Nos. 05000282/2011004 and 05000306/2011004, dated October 23, 2011, ADAMS Accession No. ML112980240.

Peach Bottom—Representative Sampling and Quality Assurance—Procedures Lack Detail To Ensure Representative Sampling

In 2007, NRC staff found that the licensee did not establish adequate quality assurance for monitoring radioactive particulates from the main plant stack. Specifically, the procedures for effluent monitoring were inadequate to detect and prevent non-representative sampling of particulates by the main plant stack RMS. Particulates were bypassing the O-ring around the particulate filter, resulting in underreporting of radioactive effluents. The NRC staff determined that a contributing factor was the lack of adequate training of personnel to recognize sample bypass. The licensee entered this issue into its CAP. Corrective actions included reevaluating affected radioactive effluent dose assessments for 2006 and 2007 to ensure no TS dose limits were exceeded, restoring representative sampling by correcting the cause of sample bypass, and evaluating extent-of-condition for both the Unit 2 and Unit 3 plant vent stack 'B' train sampling systems. Other information appears in NRC Integrated Inspection Report Nos. 05000277/2007002 and 05000278/2007002, dated May 15, 2007, ADAMS Accession No. ML071350471.

Oyster Creek—Material Condition and Representative Sampling—Sample Line Integrity Impacts Representative Sampling

In December 2010, NRC staff found that the licensee did not maintain the required continuous representative sampling of the main plant stack effluent. The main plant stack effluent sample line, supplying the main plant stack effluent RMS, was found to be separated at a tube fitting by several inches resulting in a non-representative sample of stack effluents. Subsequent inspection of main stack RMS effluent radioactivity trends showed a long-term decreasing trend from 2006 to 2010. Also, some radionuclides that were typically present in main stack samples in 2006 were absent in 2010 analysis results. Furthermore, NRC staff found that the licensee did not promptly report the degraded sample capability for impact on the emergency preparedness (EP) program and did not carry out timely compensatory sampling for certain functions of the system that supported the EP program. The licensee's ultimate corrective actions included revising site procedures to offer for an alternate sampling plan, starting compensatory monitoring, repairing the stack sample line, conducting bounding dose calculations, evaluating extent-of-condition, and entering information into the CAP. Other information appears in NRC Integrated Inspection Report No. 05000219/2010003, dated

August 9, 2010, ADAMS Accession No. ML102210111; and NRC Integrated Inspection Report No. 05000219/2010005, dated February 8, 2011, ADAMS Accession No. ML110390509.

Columbia—Emergency Planning—Incorrect RMS Response Factors Used as Part of the Emergency Plan

In 2012, NRC staff determined that the licensee used inappropriate parameters for the reactor building RMS in the emergency plan's dose projection software. In the event of a real emergency, using inaccurate radio-gas calibration and xenon-equivalency factors in dose projection software would affect the assessment of a radiological release. This condition existed between April 2000 and December 2011. The licensee entered this into their CAP. Corrective actions included correcting the erroneous values used in the emergency plan. Other information appears in NRC Inspection Report No. 05000397/2012502, dated July 26, 2012, ADAMS Accession No. ML12208A379.

Oyster Creek—Maintenance and Emergency Planning—Loss of RMS Sampling System Can Impact Emergency Planning

In 2009, NRC staff found that the licensee did not carry out timely corrective or compensatory actions when the main stack effluent monitoring system automatic cartridge sampling system was taken out of service from November 2006 through March 2009. The automatic system collected high-activity, post-accident cartridge effluent samples. After the automatic sampling system was placed in manual, to allow for manual collection of the cartridges, the chemistry staff did not document the loss of automatic sampling capability in the corrective action program, nor were the concerns forwarded to the EP group for an analysis about potential effect on the emergency plan. The licensee did not repair the system in a timely manner, nor evaluate the manual compensatory sampling measures to ensure high activity samples could be handled and analyzed without excessive personnel radiation exposure. Corrective actions included replacing solenoid valves in the automatic sampling system and returning the automatic sampling system to service. Other information appears in NRC Inspection Report 05000219/2009002, dated May 5, 2009, ADAMS Accession No. ML091250078.

BACKGROUND

For all licensees, the regulatory basis for effluent RMSs includes the requirements of 10 CFR 20.1501(a), which requires all NRC licensees to "make … surveys" that are necessary and reasonable to evaluate the "magnitude and extent of radiation levels," "concentrations or quantities of residual radioactivity," and the "potential radiological hazards of the radiation levels and residual radioactivity detected." Additionally, 10 CFR 20.1501(c) requires licensees to ensure that instruments used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated periodically for the radiation measured.

The regulatory basis for nuclear power reactor effluent RMSs includes the following:

- A design requirement for nuclear power plants to monitor effluent discharge paths for radioactivity released from nuclear power plants as provided in Criterion 64, "Monitoring Radioactivity Releases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50.

- A design requirement for nuclear power plants that instrumentation be supplied to monitor variables and systems over their anticipated ranges for accident conditions, as appropriate, to ensure adequate safety is included in Criterion 13, "Instrumentation and Control," of Appendix A to 10 CFR Part 50.

- An operational requirement for nuclear power plants in 10 CFR 50.36a(a) to: (1) keep radioactive materials released to the unrestricted area as low as is reasonably achievable, (2) have TS that will ensure compliance with the applicable provisions of 10 CFR 20.1301, "Dose limits for individual members of the public," (3) provide procedures for effluent control and for the operation and maintenance of the radioactive waste system; and (4) submit an annual report to the NRC describing radioactive effluents released to unrestricted areas.

The TS and associated ODCM of 10 CFR 50 licensees requires the maintenance of specified RMSs for radioactive effluents through calibration, testing, operational requirements, and maintenance procedures. The alarm and trip set-points associated with effluent RMSs identified therein must be set and adjusted in accordance with the TS and ODCM. Effluent RMS alarm and trip set-points can offer adequate assurance that the public radiation dose limits set forth in 10 CFR 20.1301 and that the design objectives of 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," are not exceeded.

Other considerations concerning nuclear power plant effluent RMSs include:

- The monitoring requirements set forth in 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants." Per 10 CFR 50.65(b)(2)(i), the scope of the monitoring program specified in 10 CFR 50.65(a)(1) shall include RMSs that are relied upon to mitigate accidents or transients or are used in plant EOPs. As discussed in 10 CFR 50.65(a)(2), monitoring as specified in 10 CFR 50.65(a)(1) is not required where it has been demonstrated that the performance or condition of a structure, system, or component is being effectively controlled through the performance of appropriate preventive maintenance, such that the structure, system, or component remains capable of performing its intended function.

- The emergency response plan requirements in paragraphs (b)(4) and (b)(9) of NRC regulation 10 CFR 50.47, "Emergency plans," for a standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, and for adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition. Other information on using RMSs in an emergency plan is discussed in IN 2013-01, "Emergency Action Level Thresholds outside the Range of Radiation Monitors."

- Nuclear power plant licensees may use some RMSs as part of the steam generator tube integrity program that is contained in their TS and current licensing basis.

- Nuclear power plant licensees are required, via the TS and ODCM, to report, after 30 days of inoperability of RMSs, the inoperability to the NRC in the next annual

radioactive effluent release report (in accordance with their licensing basis) and carry out any ODCM required compensatory actions. Compensatory actions for the inoperable or nonfunctional monitors typically involve sampling effluents from the affected plant systems on some routine interval (e.g., once per 24 hours) or starting backup sampling equipment.

The regulatory bases for materials license effluent RMSs include the following:

- Those persons holding licenses under 10 CFR Part 40, "Domestic Licensing of Source Material," must comply with the requirements of 10 CFR 40.63, "Tests." Subsection 40.63(c) requires all 10 CFR Part 40 licensees to perform, or permit the NRC to perform, tests of radiation detection and monitoring instruments. Licensees engaged in uranium milling, uranium hexafluoride production, or uranium enrichment activities are required to report radioactive effluents, and such other information that the NRC may require, in accordance with 10 CFR 40.65, "Effluent monitoring reporting requirements." Paragraph 40.65(a)(1) also states that the NRC may require licensees to take appropriate actions based upon these reports. In addition, Criteria 7, 7A, 8, and 8A of 10 CFR Part 40, Appendix A, require monitoring of effluents and a concomitant corrective action program for those 10 CFR Part 40 licensees engaged in uranium or uranium milling activities and the disposition of tailings or waste resulting from such milling activities.

- Those persons holding licenses under 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," must comply with the requirements of 10 CFR 70.56, "Tests." Paragraph 70.56(c) requires tests of radiation detection and monitoring instruments. Licensees authorized to possess and use special nuclear material for processing and fuel fabrication, scrap recovery, conversion of uranium hexafluoride, or in a uranium enrichment facility are required to report radioactive effluents, and such other information that the NRC may require, in accordance with 10 CFR 70.59, "Effluent monitoring reporting requirements." Section 70.59 also states that the NRC may require licensees to take appropriate actions based upon these reports.

- Those persons holding specific licenses under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-level Radioactive Waste, and Reactor-Related Greater than Class C Waste," must comply with the requirements of subsection (d) of 10 CFR 72.44, "License conditions." Specifically, 10 CFR 72.44(d)(1) requires maintenance of the equipment in an independent spent fuel storage installation's (ISFSI) radioactive waste treatment system to meet the effluents requirements of 10 CFR 72.104, "Criteria for radioactive materials in effluents and direct radiation from an ISFSI or MRS." In addition, 10 CFR 72.44(d)(2) requires the establishment of an environmental monitoring program to ensure compliance with the technical specifications for effluents. Specific licensees are required to report radioactive effluents, and such other information that the NRC may require, in accordance with 10 CFR 72.44(d)(3).[1] Paragraph 72.44(d)(3) also states that the NRC may require licensees to take appropriate actions based upon these reports.

- Those persons holding specific licenses or general licenses under 10 CFR Part 72 are subject to subsection (c) of 10 CFR 72.126, "Criteria for radiological protection," which

[1] Licensees holding a general license under 10 CFR Part 72 would make a similar report in accordance with 10 CFR 50.36a(a)(2).

requires that a means for measuring the amounts of radionuclides in effluents must be provided for in an ISFSI's handling and storage system. Paragraph 72.126(c)(2) also requires that areas containing radioactive materials must be provided with systems for measuring the direct radiation levels in and around such areas. Subsection 72.126(d) specifies that ISFSIs must be designed to offer means to limit effluents. Also, systems designed to monitor the release of radioactive materials must have means for calibration and testing their operability.

- With respect to those entities subject to 10 CFR Part 76, "Certification for Gaseous Diffusion Plants," subsection (g) of 10 CFR 76.35 requires that the application for a certificate of compliance must include a compliance status report that includes environmental and effluent monitoring data. In addition, those entities subject to 10 CFR Part 76 must comply with the requirements of subsection (c) of 10 CFR 76.123, "Tests," which requires testing of radiation detection and monitoring instruments.

To carry out the regulations listed above, licensees take actions to maintain RMSs in an operable or functional condition. When an effluent RMS fails, licensees are required to take actions to ensure that radioactive effluents continue to be adequately monitored. Although simple solutions can return an RMS to an operable or functional status, if the issue becomes repetitive, some licensees conduct a more detailed evaluation to reveal the causal factors which can sometimes reveal more permanent solutions. Some of these solutions may include replacing aging RMSs, or prioritizing the equipment's maintenance based on the input from plant RMS users (e.g., Operations, Chemistry, and Radiation Protection staff). Other solutions may involve enhanced training or improved interdepartmental coordination so that all individuals conducting work, maintenance, or calibration of the systems have a common understanding of the importance of proper operation of the system and what constitutes a fully operable or functional system.

The following NRC generic communications relate to effluent RMSs:

- NRC Generic Letter (GL) 79-003, "Offsite Dose Calculation Manual," 1979. This GL informed the addressees of additional guidance on the content of the ODCMs, including the procedural details of the regulatory requirements for effluent RMSs.

- NRC GL 79-006, "Contents of the Offsite Dose Calculation Manual," 1979. This GL informed the addressees of the importance of the ODCM and technical specifications in carrying out 10 CFR 50.36a and other Federal regulations.

- NRC IN 82-49, "Correction for Sample Conditions for Air and Gas Monitoring," 1982. This IN informed the addressees of potential errors in radioactive gaseous effluent monitoring.

- NRC IN 83-52, "Radioactive Waste Gas System Events," 1983. This IN informed the addressees of inadvertent releases because of valve mispositioning and other problems. In some events, plant staff failed to recognize the resulting unusual radiation monitor responses.

- NRC IN 86-30, "Design Limitations of Gaseous Effluent Monitoring Systems," 1986. This IN informed the addressees of issues related to the Eberline SPING-4 monitors.

- NRC IN 86-42, “Improper Maintenance of Radiation Monitoring Systems,” 1986. This IN informed the addressees that valve tag outs, temporary electrical jumpers, incorrect valve line ups, and procedure noncompliance can affect RMS instrumentation.

- NRC IN 86-43, “Problems with Silver Zeolite Sampling of Airborne Radioiodine,” 1986. This IN informed the addressees of the hazards of silver zeolite as an ignition source when hydrogen is present.

- NRC GL 89-01, “Implementation of Programmatic and Procedural Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of Radiological Effluent Technical Specifications (RETS) to the Offsite Dose Calculation Manual or to the Process Control Program,” 1989. This GL informed the addressees how to keep the radioactive effluent technical specifications in the technical specifications and relocate procedural details of RETS to the ODCM. At the same time, the NRC staff emphasized that its intent is not to reduce the level of radiological effluent controls, including the controls for effluent RMSs.

- NRC IN 2013-01, “Emergency Action Level Thresholds outside the Range of Radiation Monitors,” 2013. This IN informed addressees of failures to properly evaluate the effect of site equipment changes on the emergency plan when radiation monitors were not properly evaluated in conjunction with changes made to emergency action level (EAL) thresholds for emergency classifications.

The following NRC guidance and information documents are related to RMSs:

- Regulatory Guide (RG) 1.21, “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste,” Revision 1, 1974, and Revision 2, 2009. This guidance document contains details about reporting RMS failures in annual effluent reports to the NRC.

- RG 4.15, “Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment,” Revision 1, 1979, and Revision 2, 2007. This guidance document outlines basic but important programmatic controls that form a basis for reliable operation of RMSs. Many licensees have committed to at least parts of this regulatory guide in their licensing basis documents.

- NUREG-0737, “Clarification of TMI Action Plan Requirements,” 1980. The information in this NUREG contains insights about the performance of RMSs in high radiation fields and emergency situations.

- RG 1.97, “Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants,” Revision 3, 1983, and Revision 4, 2006. This guidance document discusses the performance of RMSs in high radiation fields and emergency situations.

- NUREG/CR-4757, "Line-Loss Determination for Air Sampler Systems," 1991. This NUREG describes how analysis results may be biased by plate-out of particulates and iodine on sample lines.

- NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," 1991. This NUREG outlines the default, minimum-acceptable effluent control and environmental monitoring programs for pressurized-water reactors.

- NUREG-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors," 1991. This NUREG outlines the default, minimum-acceptable effluent control and environmental monitoring programs for boiling-water reactors.

DISCUSSION

Effluent RMSs can serve multiple purposes such as monitoring radioactive effluents, monitoring for primary-to-secondary leakage (e.g., such as at nuclear power plants), and for use in conjunction with emergency action levels in the emergency plan. Maintaining an operable or functional RMS may involve personnel in the following departments: maintenance, work control, operations, chemistry, health physics, emergency planning, system engineering, design engineering, and instrumentation and control.

Several of the operational experience examples in this IN occurred because of challenges to effective coordination between these numerous groups and the lack of sensitivity to, or awareness of, the deficiencies that were reasonably within the licensee's ability to detect and correct. In many instances, once deficiencies were identified, RMSs remained out of service for extended periods of time. In some cases, when the RMS was out of service, the backup or alternate sampling requirements were not always adequately fulfilled or were unreasonably delayed. Some operational experience involved poor maintenance of effluent monitor design-basis documents (e.g., primary calibration records, calibration source documentation, and vendor manuals) as part of the overall effluent quality assurance (QA) program. Licensee procedures used to service, maintain, and use RMS instrumentation can have a significant effect on the reliable operation of RMS instrumentation.

In summary, the NRC found a broad range of effluent monitoring system deficiencies in its review of operating experience. The review found that deficiencies associated with the following factors can degrade the effectiveness of effluent RMSs:

- Routine and preventive maintenance of RMSs and associated ventilation systems.

- Evaluation of the effect of RMS design modifications on representative sampling.

- Advanced planning to ensure any required backup monitoring or compensatory sampling is promptly initiated when effluent RMSs are out-of-service.

- Advanced planning to ensure necessary actions are taken in response to RMS alarm conditions, including reporting and controlling releases. This advanced planning may be particularly applicable when back-out criteria or administrative action levels are used in conjunction with temporary or backup radiation monitors.

- Calibration of effluent monitors using appropriate radioactive sources for primary and secondary calibrations, including the use of correction factors in various applications, such as emergency planning dose-projection software.

- QA to find deficiencies in the sampling and measurement process and to establish confidence in the results. QA practices may include: (1) trending and tracking of RMS performance and maintenance (e.g., by reviewing trends for significant changes in radioactive effluents or observing unexpected changes in sample appearance); (2) verifying representative sampling following RMS maintenance or design modifications; and (3) maintaining and using RMS design-basis documents, such as primary calibration records, calibration source documentation, and vendor manuals.

- Training for plant personnel concerning RMS functions and ODCM requirements.

- Coordination and communication among numerous, different plant groups whose activities may affect RMS functions with respect to radioactive effluent monitoring and the emergency plan.

Licensees can carry out corrective actions, such as those described in this document, to address the factors that are known to degrade the effectiveness of RMSs.

CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below or to the appropriate Office of Nuclear Reactor Regulation project manager.

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Note: NRC generic communications may be found on the NRC public Web site, http://www.nrc.gov/reading-rm/doc-collections/, under Document Collections.

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