

November 16, 2009

MEMORANDUM TO: Undine S. Shoop, Chief  
Health Physics and Human Performance Branch  
Division of Inspection and Regional Support  
Office of Nuclear Reactor Regulation

FROM: Roger L. Pedersen, Senior Health Physicist */RA/*  
Health Physics and Human Performance Branch  
Division of Inspection and Regional Support  
Office of Nuclear Reactor Regulation

SUBJECT: PUBLIC MEETING WITH NUCLEAR ENERGY INSTITUTE (NEI) STAFF  
AND INDUSTRY HEALTH PHYSICS TASK FORCE

DATE AND TIME: December 02, 2009  
1:00 PM – 3:30 PM

LOCATION: One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738  
Room O-6B4

PURPOSE: To conduct a public meeting with the industry and NRC staff on current health physics topics, and potential changes to the Radiation Safety Cornerstones of the Reactor Oversight Process (ROP). Participants will discuss the intent and purpose of the enclosed draft revised ROP Radiation Safety baseline inspection procedures (IP 71124 through IP 71124.08).

CATEGORY 2:\* This is a Category 2 meeting. The public is invited to participate in this meeting by discussing regulatory issues with the Nuclear Regulatory Commission (NRC) at designated points identified on the agenda.

AUDIO-TELE-  
CONFERRING: Interested members of the public can participate in this meeting via a toll-free audio teleconference. Please call the NRC meeting contact listed on the NRC web site the week prior to the meeting to get the call-in telephone number and pass code.

CONTACT: Roger L. Pedersen, NRR/DIRS  
301-415-3162

PARTICIPANTS: Participants from the NRC include members of the Office of Nuclear Reactor Regulation (NRR), and staff from Regions I, II, III, and IV.

NRC	INDUST	RY
R. Pedersen	R.	Andersen
IP Re-alignment Working Group		NEI HP Task Force
S. Garry	E.	Anderson

Enclosures:

1. Agenda
2. IP 71124 Radiation Safety – Public and Occupational
3. IP 71124.01 Radiological Hazard Assessment and Exposure Controls
4. IP 71124.02 Occupational ALARA Planning and Controls
5. IP 71124.03 In-Plant Airborne Radioactivity Control and Mitigation
6. IP 71124.04 Occupational Dose Assessment
7. IP 71124.05 Radiation Monitoring Instrumentation
8. IP 71124.06 Radioactive Gaseous and Liquid Effluent Treatment
9. IP 71124.07 Radiological Environmental Monitoring Program
10. IP 71124.08 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation

\* Commissions' Policy Statement on "Enhancing Public Participation in NRC Meetings,"  
67 *Federal register* 36920, May 28, 2002

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<u>NRC</u>		<u>INDUSTRY</u>
R. Pedersen	R.	Andersen
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**PUBLIC MEETING AGENDA**  
 NEI AND NRC HP STAFF  
 December 2, 2009, 1:00 PM – 3:30 PM  
 11555 Rockville Pike  
 Rockville, MD 20852-2738  
 Room O-6B4

TIME	SUBJECT	LEAD
01:00 PM - 01:15 PM	Introduction and Purpose of Meeting	R. Pedersen (NRC) & E. Anderson (NEI)
01:15 PM – 1:45 PM	Realignment of ROP Radiation Safety Baseline Inspection Procedures	R. Pedersen (NRC)
1:45 PM – 2:45 PM	Participant Questions Concerning Draft Inspection Procedures (IP 71124 through IP 71124.08)	NEI HP Task Force R. Pedersen (NRC)
2:45 PM – 3:15 PM	Public Questions & Answers	Public Participants
3:15 PM – 3:30 PM	Closing Comments	E. Anderson (NEI) & R. Pedersen (NRC)

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## INSPECTION PROCEDURE 71124

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### RADIATION SAFETY—PUBLIC AND OCCUPATIONAL

PROGRAM APPLICABILITY: 2515

EFFECTIVE DATE: January 1, 2010

#### 71124-01 INSPECTION OBJECTIVE

To independently gather sufficient information by performing a minimum level of baseline inspection to determine whether licensee performance meets the following cornerstone objectives:

01.01 Public Radiation Safety (P). To ensure adequate protection of public health and safety from exposure to radioactive material released into the public domain as a result of routine civilian nuclear reactor operations.

01.02 Occupational Radiation Safety (O). To ensure adequate protection of worker health and safety from exposure to radiation or radioactive material during routine civilian nuclear reactor operations.

#### 71124-02 INSPECTION REQUIREMENTS

02.01 Inspection Planning. Plan and perform inspections in accordance with the following attachments to this procedure:

Attachment 01: Radiological Hazard Assessment and Exposure Controls (P, O)

Attachment 02: Occupational ALARA Planning and Controls (O)

Attachment 03: In-Plant Airborne Radioactivity Control and Mitigation (O)

Attachment 04: Occupational Dose Assessment (O)

Attachment 05: Radiation Monitoring Instrumentation (P, O)

Attachment 06: Radioactive Gaseous and Liquid Effluent Treatment (P)

Attachment 07: Radiological Environmental Monitoring Program (P)

Attachment 08: Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (P, O)

ENCLOSURE 2

The above list indicates the cornerstones that typically apply to each inspection procedure. Findings from these inspections must be grouped by the inspector into the cornerstone to which they best apply (see inspection guidance tables in the procedures and cornerstone charts in Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program—Operations Phase," Appendix A, Attachment 2, for guidance). Each finding must be aligned with only one cornerstone following application of the significance determination process (SDP), described in IMC 0609, "Significance Determination Process," to avoid double-counting in assessing performance. Some of the potential findings within the inspectable areas of this inspection procedure impact the licensee's ability to respond to the radiological conditions during an accident, such as findings associated with respiratory protection devices (e.g., self-contained breathing apparatus) or radiation monitoring instrumentation necessary to control radiation exposure of emergency workers. The significance of these findings related to emergency preparedness should normally be assessed against the SDP examples (primarily 4.10 and 4.11) in IMC 0609, Appendix B.

**02.02 Problem Identification and Resolution.** Using the inspection attachments listed above, review a selected sample of issues, verify that the issues have been entered into the corrective action program, and verify, for a selected sample of related problems, the effectiveness of the licensee's corrective actions.

**02.03 Third-Party Reviews.** Review significant site-specific third-party evaluation reports for insights into the licensee's program and to aid in selecting areas (samples) for review. Institute of Nuclear Power Operations (INPO) reports are normally reviewed by resident inspectors only. Coordinate with the residents and review regional policy before reviewing INPO documents.

## 7112X-03 INSPECTION GUIDANCE

### 03.01 General Guidance.

- a. **Adequate Protection.** The regulatory requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," Part 20, "Standards for Protection against Radiation," and Part 50, "Domestic Licensing of Production and Utilization Facilities," ensure that licensees provide adequate protection of occupational workers and members of the public from exposure to radiation and radioactive materials during the normal operation, including anticipated operational occurrences, of a nuclear power plant. In general, adequate protection from routine exposures is demonstrated by maintaining the resultant doses below the applicable limits and consistent with the as low as reasonably achievable (ALARA) requirements of 10 CFR 20.1101, "Radiation Protection Programs," and 10 CFR 50.36(a). However, in certain instances (such as where the potential for a substantial acute dose is high, or a defective respiratory protection device has been used), the risk to health and safety is not reflected in the resulting dose and must be evaluated individually.

- b. Applicable Performance Indicators. The inspections conducted under this procedure provide information on licensee performance in areas that are not measured by, or not fully measured by, the following performance indicators (PIs): unintended occupational radiation exposure, control of access to high (above 1 rem/hour) and very high radiation areas (Occupational Radiation Safety Cornerstone); and the release of radioactive materials in effluents that exceed a substantial fraction of the design criteria in 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," to 10 CFR Part 50 (Public Radiation Safety Cornerstone), as defined in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guidelines." In fulfilling the inspection requirements of the attachments, the inspector needs to exercise care to not spend time inspecting activities or characteristics that are already covered by a PI, although Inspection Procedure (IP) 71151, "Performance Indicator Verification," does gather such information.

The PI in the Public Radiation Safety Cornerstone monitors the performance of the radiological effluent treatment and monitoring program. The PI is based on radiation dose resulting from effluent releases and does not evaluate the performance of the radiological environmental monitoring or the processing, handling, storage, or transportation of solid radioactive materials.

The primary means by which licensees maintain an appropriate level of safety is through an effective problem identification and resolution (PI&R) program to correct deficiencies involving human performance, equipment, programs, and procedures. The inspection program verifies that the NRC's confidence in licensees' programs is still deserved and periodically verifies that the final actions on some of the lower level violations are proper. See Section 03.02.02 below for additional guidance on PI&R.

- c. Risk-Informed, Performance-Based Inspections. The NRC inspection program covers only small samples of licensee activities in any particular area. The principle of "smart sampling" is employed by the inspector in selecting items to review in each area, as opposed to a statistically based random selection. Smart sampling uses risk information and insights (gained from the licensee's quality assurance (QA) audits, independent evaluations, or operational experience) to focus on those aspects of plant operations and licensee activities that could pose the greatest risk to public health and safety. Performance-based inspections evaluate licensee performance by focusing on the outcomes of licensee programs (in terms of the risk of impacting the cornerstone objectives), as opposed to drawing conclusions on whether the licensee is in compliance with a regulation or standard irrespective of the risk impact.

### 03.02 Specific Guidance.

- a. Inspection Planning. To the extent practical, inspections should be scheduled to coincide with plant evolutions and work activities that could have significant impact on the areas being inspected. Conclusions about the licensee's performance should be based on inspector observation of risk-significant activities. Discussions with plant

personnel and reviewing documents should be used to enhance or verify performance-based observations.

- b. Problem Identification and Resolution The Reactor Oversight Process is based on the presumption that licensees have mature, robust programs to self-identify and correct nonconformances and other program deficiencies throughout the conduct of their operations. The purpose of the reviews of P&IR programs within each baseline inspection procedure attachment is to confirm that the licensee is finding, documenting, and correcting (in a timely manner, commensurate with their safety significance) program deficiencies in each of the inspectable areas. The purpose of these PI&R reviews is not to document each nonconformance with a regulatory requirement that the licensee has entered into its corrective action program.

Problem identification and corrective action programs are an integral part of an effective QA program. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires nuclear power plant licensees to establish a QA program, including measures to control the issuance of instructions, procedures, and drawings, including changes, which prescribe activities affecting the quality of safety-related structures, systems, and components (SSCs), and to inspect the conformance to these documents in the performance of these activities. To the extent that radiation protection activities pertain to safety-related SSCs (e.g., high-range effluent monitors, radwaste systems), they are within the scope of the Appendix B required program. However, several other areas within the radiation protection procedures are not explicitly required to be addressed in the Appendix B QA program. For example, license conditions in the plant technical specifications require QA programs for radiological effluent and environmental monitoring systems. In addition, 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," Subpart H, "Quality Assurance," provides QA requirements applicable to the packaging of licensed radioactive materials for shipment. However, paragraph (f) of 10 CFR 71.101, "Quality Assurance Requirements," states that the QA requirements of 10 CFR Part 50, Appendix B, if applied to the transport of licensed radioactive material, are sufficient to meet the requirements of 10 CFR Part 71, Subpart H. For other aspects of the radiation protection program, Subpart B of 10 CFR Part 20 requires each licensee to develop, document, and implement a radiation protection program and to review the program content and implementation at least yearly. Most licensees include radiation protection procedures in the scope of their QA audits and PI&R programs as part of their QA program, as required by Appendix B to 10 CFR Part 50, in accordance with the guidance in Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)."

The inspector should use the guidance in IP 71152, "Identification and Resolution of Problems," and IMC 2515, Appendix A, when (1) verifying the effectiveness of corrective actions for issues identified that are within the scope of 10 CFR Part 50, Appendix B, and (2) determining that the PI&R program is sufficient to meet the radiation protection review and QA requirements of 10 CFR Parts 20, 50, and 71.

The inspector should determine if the following activities are being conducted in an effective and timely manner (e.g., commensurate with the importance to safety and risk significance), as part of the licensee's review of its Radiation Protection Program:

1. initial problem identification, characterization, and tracking
  2. disposition of operability/reportability issues
  3. evaluation of safety significance/risk and priority for resolution
  4. identification of repetitive problems
  5. identification of contributing causes
  6. identification and implementation of effective corrective actions
  7. resolution of noncited violations tracked in corrective action system(s)
  8. implementation/consideration of risk-significant operational experience feedback
- c. Third-Party Reviews. The review of third-party audits is intended to gain insights into the licensee's performance in a particular area for the purposes of inspection planning and smart sampling. This inspection requirement does not include a detailed inspection or followup of the licensee's corrective actions resulting from the third-party review findings. See Section 13.01, "Treatment of Third Party Reviews," of IMC 0612, "Inspection Reports," for more specific guidance on how to conduct and document detailed NRC review of third-party evaluations, accreditation reports, findings, recommendations, and corrective actions.

END

Revision History for  
IP 71124

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It (with its associated eight attachments) supersedes inspection requirements in IP 71121 and 71122 (and attachments) in their entirety.	YES	09/09/2009	ML092810406

## ATTACHMENT 71124.01

INSPECTABLE AREA: Radiological Hazard Assessment and Exposure Controls

CORNERSTONE: Occupational Radiation Safety 70%  
Public Radiation Safety 30%

EFFECTIVE DATE: January 1, 2010

INSPECTION BASIS: Title 10 of the *Code of Federal Regulations* (10 CFR) Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," and 10 CFR Part 20, "Standards for Protection against Radiation," have regulatory requirements to ensure that licensees provide adequate protection of occupational workers from the exposure to radiation and radioactive materials during the normal operation, including anticipated operational occurrences, of a nuclear power plant. In general, adequate protection from routine exposures is demonstrated by maintaining the resultant doses below the applicable limits and as low as reasonably achievable (ALARA). This inspectable area is partially covered by the Occupational Radiation Safety Performance Indicator (PI) in terms of controlling access to radiologically significant areas and maintaining control over occupational radiation exposures. However, the PI may not reflect situations where the radiological hazards are not adequately identified, or where the risk to the workers' health and safety from the exposure situation is not necessarily reflected by the dose outcome (i.e., substantial potential exists for an overexposure or substantial release of radioactive materials). The identification and control of radioactive materials that have a potential for release outside the restricted area, and the resultant risk of radiation exposures to members of the public, are not reflected in the Public Radiation Safety PI.

LEVEL OF EFFORT: Inspect Annually

### 71124.01-01 INSPECTION OBJECTIVES

01.01 To review and assess licensee performance in assessing the radiological hazards in the workplace associated with licensed activities and the implementation of appropriate

ENCLOSURE 3

radiation monitoring and exposure control measures for both individual and collective exposures.

01.02 To verify that the licensee is properly identifying and reporting PIs for the Occupational Radiation Safety Cornerstone.

01.03 To identify those performance deficiencies that were reportable as a PI and which may have represented a substantial potential for overexposure of the worker.

## 71124.01-02 INSPECTION REQUIREMENTS

02.01 Inspection Planning. Review all licensee PIs for the Occupational Exposure Cornerstone for followup. Review the results of radiation protection program audits (e.g., licensee's quality assurance audits or other independent audits). Review any reports of operational occurrences related to occupational radiation safety since the last inspection. The results of the audit and operational report reviews should be used to gain insights into overall licensee performance and focus the inspector's inspection activities on areas that are most likely to yield safety-significant results, consistent with the principle of "smart sampling."

### 02.02 Radiological Hazard Assessment.

- a. Determine if, since the last inspection, there have been changes to plant operations that may result in a significant new radiological hazard for onsite workers or members of the public. Verify that, consistent with 10 CFR 20.1501, "General," the licensee has assessed the potential impact of these changes and has implemented periodic monitoring, as appropriate, to detect and quantify the radiological hazard.
- b. Review the last two radiological surveys from three to six selected plant areas. Verify that the thoroughness and frequency of the surveys is appropriate for the given radiological hazard.
- c. Conduct walkdowns of the facility, including radioactive waste processing, storage, and handling areas to evaluate material conditions and potential radiological conditions (radiological control area (RCA), protected area, controlled area, contaminated tool storage, or contaminated machine shops). This assessment should include selective facility walkdowns and independent radiation measurements to verify conditions.
- d. Select three to five radiologically risk-significant work activities that involve exposure to radiation. Verify that appropriate prework surveys were performed (type of survey, sensitivity of survey technique), which were appropriate to identify and quantify the radiological hazard and to establish adequate protective measures. Evaluate the radiological survey program to determine if hazards are properly identified, including the following:

1. identification of hot particles
  2. the presence of alpha emitters
  3. the potential for airborne radioactive materials, including the potential presence of transuranics and/or other hard-to-detect radioactive materials (This evaluation may include licensee planned entry into nonroutinely entered areas subject to previous contamination from failed fuel.)
  4. the hazards associated with work activities that could suddenly and severely increase radiological conditions (e.g., in-core detector movement, impact of fuel moves in affected areas of drywell/aux building, movement of irradiated materials in the spent fuel pool)
  5. severe radiation field dose gradients that can result in nonuniform exposures of the body
- e. Select three to five air sample survey records and verify that samples are collected and counted in accordance with licensee procedures. Observe work in potential airborne areas, and verify that air samples are representative of the breathing air zone. If the licensee uses continuous air monitors to monitor real-time airborne conditions, verify that they are located in areas with low background to minimize false alarms. If the licensee uses skid-mounted particulate, iodine, and noble gas (PING)-type instruments to monitor airborne conditions, verify that the air being monitored is representative of the actual work areas. Verify that the licensee has a program for monitoring levels of loose surface contamination in areas of the plant with the potential for the contamination to become airborne.

#### 02.03 Instructions to Workers.

- a. Select three to five containers holding nonexempt licensed radioactive materials that may cause unplanned or inadvertent exposure of workers, and verify that they are labeled and controlled in accordance with 10 CFR 20.1904, "Labeling Containers," or meet the requirements of 10 CFR 20.1905(g). Emphasis should be on the review of containers that have the potential for containing the most significant radiological hazard (i.e., containers that provide shielding of the source, or that contain significant amounts of loose contamination that could become an airborne hazard).
- b. Review three to five radiation work permits (RWPs) used to access high radiation areas (HRAs) and identify what work control instructions or control barriers have been specified. Use plant-specific technical specification HRA requirements as the standard for the necessary barriers. Verify that allowable staytimes or permissible dose (including from the intake of radioactive material) for radiologically significant work under each RWP is clearly identified. Verify that electronic personal dosimeter (EPD) alarm setpoints are in conformance with survey indications and plant policy.

- c. As available, select one to two occurrences where a worker's EPD noticeably malfunctioned or alarms. Verify that workers responded appropriately to the off-normal condition. Verify that the issue was included in the corrective action program and dose evaluations were conducted as appropriate.
- d. For those work activities selected in 0202(d)(4) above, verify that the licensee has established a means to inform workers of changes that could significantly impact their occupational dose.

02.04 Contamination and Radioactive Material Control.

- a. Observe several locations (if there are several release points from the RCA, or if there are several RCAs on site) where the licensee monitors potentially contaminated material leaving the RCA, and inspect the methods used for control, survey, and release from these areas. When possible, observe the performance of personnel surveying and releasing material for unrestricted use to verify that the work is performed in accordance with plant procedures and the procedures are sufficient to control the spread of contamination and prevent unintended release of radioactive materials from the site. Verify that the radiation monitoring instrumentation has appropriate sensitivity for the type(s) of radiation present.
- b. Review the licensee's criteria for the survey and release of potentially contaminated material. Verify that there is guidance on how to respond to an alarm that indicates the presence of licensed radioactive material.
- c. Review the licensee's procedures and records to verify that the radiation detection instrumentation is used at its typical sensitivity level based on appropriate counting parameters (i.e., counting times and background radiation levels). Verify that the licensee has not established a de facto "release limit" by altering the instrument's typical sensitivity through such methods as raising the energy discriminator level or locating the instrument in a high-radiation background area.
- d. Select two to three sealed sources from the licensee's inventory records that present the greatest radiological risk. Verify that sources are accounted for and have been verified to be intact (i.e., they are not leaking their radioactive content).
- e. Verify that any transactions (since the last inspection) involving nationally tracked sources were reported in accordance with 10 CFR 20.2207.

02.05 Radiological Hazards Control and Work Coverage. This section should be performed in concert with Section 02.02 of this procedure.

- a. During tours of the facility and review of ongoing work selected in 02.02 (above), evaluate ambient radiological conditions (e.g., radiation levels or potential radiation levels). Verify that existing conditions are consistent with posted surveys, RWPs, and worker briefings, as applicable.

- b. During job performance observations, verify the adequacy of radiological controls, such as required surveys (including system breach radiation, contamination, and airborne surveys), radiation protection job coverage (including audio and visual surveillance for remote job coverage), and contamination controls. Evaluate the licensee's means of using EPDs in high noise areas as HRA monitoring devices.
- c. Verify that radiation monitoring devices (thermoluminescent (TLD) dosimeters, optically stimulated luminescence (OSL) dosimeters, etc.) are placed on the individual's body consistent with the method that the licensee is employing to monitor dose from external radiation sources. Verify that the dosimeter is placed in the location of highest expected dose or that the licensee is properly employing an NRC-approved method of determining effective dose equivalent.
- d. For high-radiation work areas with significant dose rate gradients (a factor of 5 or more), review the application of dosimetry to effectively monitor exposure to personnel. Verify that licensee controls are adequate.
- e. Review three to five RWPs for work within airborne radioactivity areas with the potential for individual worker internal exposures. Evaluate airborne radioactive controls and monitoring, including potentials for significant airborne levels (e.g., grinding, grit blasting, system breaches, entry into tanks, cubicles, reactor cavities). For these selected airborne radioactive material areas, verify barrier (e.g., tent or glove box) integrity and temporary high-efficiency particulate air (HEPA) ventilation system operation. Focus on any work areas with a history of, or the potential for, airborne transuranics or other hard-to-detect radionuclides.
- f. Examine the licensee's physical and programmatic controls for highly activated or contaminated materials (nonfuel) stored within spent fuel and other storage pools. Verify that appropriate controls (i.e., administrative and physical controls) are in place to preclude inadvertent removal of these materials from the pool.
- g. Conduct selective inspection of posting and physical controls for HRAs and very high radiation areas (VHRAs), to the extent necessary to verify conformance with the Occupational PI.

02.06 Risk-Significant High Radiation Area and Very High Radiation Area Controls. Focus on verifying aspects of the licensee PI activities for high-risk HRAs (greater than 25 rem in 1 hour at 30 centimeters from the source) and for all VHRAs. These areas provide the potential for significant worker overexposures, and in some cases, potentially lethal acute exposures.

- a. Discuss with the Radiation Protection Manager (RPM) the controls and procedures for high-risk HRAs and VHRAs. Focus on any procedural changes since the last inspection. Discuss methods employed by the licensee to provide stricter control of VHRA access as specified in 10 CFR 20.1602, "Control of Access to Very High Radiation Areas," and Regulatory Guide 8.38, "Control of Access to High and Very

High Radiation Areas of Nuclear Plants.” Verify that any changes to licensee procedures do not substantially reduce the effectiveness and level of worker protection.

- b. Discuss with no more than two first-line health physics (HP) supervisors (or equivalent positions having backshift HP oversight authority) the controls in place for special areas that have the potential to become VHRAs during certain plant operations. Determine if these plant operations (e.g., pressurized-water reactor (PWR) thimble withdrawal into the reactor cavity sump; boiling-water reactor (BWR) traversing in-core probe movement; BWR drywell fuel transfer slot area; spent fuel pool, cavity, or pit diving) require communication beforehand with the HP group, so as to allow corresponding timely actions to properly post, control, and monitor the radiation hazards including re-access authorization.
- c. Verify that licensee controls for all VHRAs, and areas with the potential to become a VHRA, ensure that an individual is not able to gain unauthorized access to the VHRA.

#### 02.07 Radiation Worker Performance.

- a. During job performance observations, observe radiation worker performance with respect to stated radiation protection work requirements. Determine if workers are aware of the significant radiological conditions in their workplace and the RWP controls/limits in place and that their performance reflects the level of radiological hazards present.
- b. Review up to 10 radiological problem reports since the last inspection that find the cause of the event to be human performance errors. Determine if there is an observable pattern traceable to a similar cause. Determine if this perspective matches the corrective action approach taken by the licensee to resolve the reported problems. Discuss with the RPM any problems with the corrective actions planned or taken.

#### 02.08 Radiation Protection Technician Proficiency.

- a. During job performance observations, observe the performance of the radiation protection technician with respect to all radiation protection work requirements. Determine if technicians are aware of the radiological conditions in their workplace and the RWP controls/limits and if their performance is consistent with their training and qualifications with respect to the radiological hazards and work activities.
- b. Review a maximum of 10 radiological problem reports since the last inspection that find the cause of the event to be radiation protection technician error. Determine if there is an observable pattern traceable to a similar cause. Determine if this perspective matches the corrective action approach taken by the licensee to resolve the reported problems.

02.09 Problem Identification and Resolution. Verify that problems associated with radiation monitoring and exposure control are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance. (optional) In addition to the above, verify the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve radiation monitoring and exposure controls. Because a licensee's evaluation of industry operating experience can be critical, determine whether licensees are assessing the applicability of operating experience to their respective plants.

## 71124.01-03 INSPECTION GUIDANCE

03.01 Inspection Planning. To the extent practicable, inspections should be scheduled to coincide with refueling outages or other radiologically significant plant modifications so as to maximize the opportunities for the inspector to verify licensee performance through direct observation.

03.02 Radiological Hazard Assessment.

03.03 Instructions to Workers.

- a. Changes in plant operation that may result in changes to the scope of radiological hazards include but are not limited to the following:
  1. degraded reactor fuel integrity that can result in hot particle contamination, or the presence of transuranic nuclides (or other hard to detect radionuclides), for work activities previously unaffected
  2. changes in reactor water chemistry (e.g., hydrogen injection in a BWR) that can result in significant changes to the in-plant radiation source term
  3. significant onsite spills, or contamination of uncontaminated systems, that can result in a new pathway for the release, or potential release, of radioactive materials off site
  4. storage of radioactive materials in the owner-controlled area (e.g., remote or satellite RCAs within the plant site)
  5. degraded material conditions of radwaste systems or other plant components containing radioactivity
- b. No guidance provided.
- c. Verify the adequacy of the licensee's method for evaluating anomalous electronic dosimeter (ED) readings. Verify that the licensee reviews histogram and/or radiological survey data as appropriate to validate readings. Determine if sufficient

information is documented in reports of unusual dosimetry occurrence to substantiate either the dose assignment or determination that the ED reading/alarm was invalid.

- d. Areas that have a potential for sudden changes in radiological conditions include BWR turbine building access during power changes, in-core detector areas, initial primary containment entries, and radwaste transfer operations.

Continuous air monitors positioned throughout the power plant are often used as initial trending indicators of increasing airborne radioactive material levels. While identified increases in airborne levels may not be dosesignificant (as indicated by the directly measurable beta- and gamma -emitting radionuclides), power plants with known transuranic contamination problems should consider and assess this transuranic component when appropriate. This focus is especially vital during certain maintenance activities in known transuranic-contaminated areas. See Information Notice (IN) 97-36, "Unplanned Intakes by Worker of Transuranic Airborne Radioactive Materials and External Exposure Due to Inadequate Control of Work," dated June 20, 1997, for a discussion of previous problems and guidance in this area.

#### 03.04 Contamination and Radioactive Material Control.

- a. If workers are permitted to self-survey personal items, selectively verify by review of one or two controls points that workers are complying with applicable guidance and training.
- b. The regulation in 10 CFR Part 20 does not contain release limits for the release of contaminated material to unrestricted areas; thus, the licensee's criteria should be that no detectable licensed radioactive material (radioactive gaseous and liquid effluents excepted) is released for unrestricted use or as waste into an unrestricted area.

Review the licensee's equipment to ensure that the radiation detection sensitivities are consistent with the NRC guidance contained in Office of Inspection and Enforcement (IE) Circular 81-07, "Control of Radioactively Contaminated Material," and IN 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities," dated December 2, 1985, for surface contamination and Health Physics Position (HPPOS) 221 from NUREG/CR-5569, Revision 1, "Health Physics Positions Data Base," dated May 1, 1992, for volumetrically contaminated material. If applicable, as discussed in HPPOS 250, verify that the licensee performs radiation surveys to assess radionuclides that decay via electron capture.

- c, d, and e. No guidance provided

#### 03.05 Surveys and Radiation Work Coverage/Controls.

- a and b. No guidance provided.

- c. Dosimeter selection and placement criteria: The review should include the adequacy of the licensee's criteria for utilization and placement of whole body and extremity dosimeters, including their use in nonuniform radiation fields. In 10 CFR 20.1201(c), no work areas are exempt from the requirement to measure deep dose equivalent (DDE) at the part of the body receiving the highest exposure. However, while not a focus of this inspection, the licensee's procedure should have reasonable criteria for complying with 10 CFR 20.1201(c) for workers where dose rates are greater than 10 millirem (mrem) per hour. Additionally, assuming a dose gradient of 1.5 or more, it would not be reasonable to move the personal dosimeter (or provide for additional dosimeters), unless an individual's dose missed by not moving the dosimeter was "significant" (e.g., 30 mrem for an individual for the work shift). From a collective dose perspective (assuming a dose gradient of 1.5 or more), a "missed" collective dose of 250 mrem or more for a job is a reasonable threshold action criterion for the licensee to provide additional personal monitoring (or move the dosimeter) to measure the highest DDE, consistent with 10 CFR 20.1201(c). The licensee may be using an NRC-approved method of measuring effective dose equivalent. The dosimeter placement should be consistent with the approved method.
- d. Focus on any underwater diving activities, where the dose rate gradients are severe, thereby increasing the necessity of providing multiple dosimeters and/or enhanced job controls.
- e. No guidance provided.
- f. Licensees may store highly activated materials (e.g., fuel channels and irradiated low power range monitors) underwater on short-hangers, which could be inadvertently raised to the pool surface. If unshielded, these materials could create an HRA or VHRA. For applicable guidance and a history of previous events, see Regulatory Guide 8.38, Section C.4.2; IN 90-33, "Sources of Unexpected Occupational Radiation Exposure at Spent Fuel Storage Pools," dated May 9, 1990; HPPOS 016 and 245 in NUREG/CR-5569 and HPPOS 333 (memorandum, Miller to Joyner et al., January 30, 1995, at ADAMS Accession No. ML040760364); and Questions and Answers 447 and 448 in NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20," dated May 1, 1994.
- g. The standard of performance is the technical specifications, 10 CFR Part 20, and Regulatory Guide 8.38, as regards administrative controls, barrier enhancements, and key controls.

03.06 Risk-Significant High Radiation Area and Very High Radiation Area Controls. The intent of this limited inspection oversight requirement is to maintain continued NRC vigilance of the licensee's program and procedural controls and plant staff awareness of these special, accessible areas where the potential for lethal overexposure exists.

- a. Do not repeat this HP inspection requirement during the sitewide annual PI verification team inspection.
- b. Determine if entries are made into areas controlled as VHRAs. For example, PWRs can control primary containments as VHRAs during power operations, and BWRs may control traversing in-core probe areas or fuel transfer slot areas in the drywell as VHRAs. Discuss with licensee management the required procedural controls and HP technician coverage during such entries.
- c. See Regulatory Guide 8.38, Section C.4, Appendices A and B, for guidance for specific work areas and activities that have documented histories of worker overexposures.

See applicable parts of NUREG/CR-6204 and NUREG/CR-5569.

03.07 through 03.9 No guidance provided.

#### 71124.01-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 32 hours on average (with a range of 26 hours to 38 hours) annually to perform the requirements of this attachment.

#### 71124.01-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP71124.01

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810383

## ATTACHMENT 71124.02

INSPECTABLE AREA: Occupational ALARA Planning and Controls

CORNERSTONE: Occupational Radiation Safety

EFFECTIVE DATE: January 1, 2010

INSPECTION BASIS: Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1101(b) requires licensees to use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles to achieve occupational doses that are as low as is reasonably achievable (ALARA). Performance in this area is judged on whether the licensee has taken appropriate measures to track, and if necessary, to reduce exposures and not whether each individual exposure and dose represent an absolute minimum or whether the licensee has used all possible methods to reduce exposures. The stochastic risk effect of exposure is based on the linear nonthreshold exposure model. Increasing individual or collective exposures equates to increased risk of cancer or genetic effects. Licensees are required to manage these risks to ALARA levels. This inspectable area verifies aspects of the Occupational Radiation Safety Cornerstone for which there are no indicators to measure performance.

LEVEL OF EFFORT: Inspect biennially

### 71124.02-01 INSPECTION OBJECTIVE

01.01 To assess performance with respect to maintaining individual and collective radiation exposures ALARA. This inspection will determine whether the licensee's ALARA program, including administrative, operational, and engineering controls, is effectively maintaining occupational exposure ALARA.

ENCLOSURE 4

02.01 Inspection Planning.

- a. Review pertinent information regarding plant collective exposure history, current exposure trends, and ongoing or planned activities in order to assess current performance and exposure challenges. Determine the plant's 3-year rolling average (TYRA) collective exposure. The overall collective exposure performance will be used as an input to establish the resources required to complete this inspection attachment and to provide a perspective on significance for any resulting inspection finding assessment.
- b. Determine the site-specific trends in collective exposures (using NUREG-0713, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities," and plant historical data) and source term (average contact dose rate with reactor coolant piping) measurements (using Electric Power Research Institute (EPRI) TR-108737, "BWR Iron Control Monitoring Interim Report," issued December 1998, and/or plant historical data, when available).
- c. Review site-specific procedures associated with maintaining occupational exposures ALARA. Include a review of processes used to estimate and track exposures from specific work activities.

02.02 Radiological Work Planning.

- a. Obtain from the licensee a list of work activities ranked by actual or estimated exposure that are in progress or that have been completed during the last outage, and select three to five work activities of the highest exposure significance, preferably those activities projected to result in a dose of 5 person-rem or greater.
- b. Review the ALARA work activity evaluations, exposure estimates, and exposure mitigation requirements. Determine if the licensee has reasonably grouped the radiological work into work activities, based on historical precedence, industry norms, and/or special circumstances.
- c. Verify that the licensee's planning identified appropriate dose mitigation features; considered, commensurate with the risk of the work activity, alternate mitigation features; and defined reasonable dose goals. Verify that the licensee's ALARA assessment has taken into account decreased worker efficiency from use of respiratory protective devices and or heat stress mitigation equipment (e.g., ice vests). Determine if the licensee's work planning considered the use of remote technologies (such as teledosimetry, remote visual monitoring, and robotics) as a means to reduce dose and the use of dose reduction insights from industry operating experience and plant-specific lessons learned. Verify the integration of ALARA requirements into work procedure and radiation work permit (RWP) documents.

- d. Compare the results achieved (dose rate reductions, person-rem used) with the intended dose established in the licensee's ALARA planning for these work activities. Compare the person-hour estimates provided by maintenance planning and other groups to the radiation protection group with the actual work activity time requirements, and evaluate the accuracy of these time estimates. Determine the reasons (e.g., failure to adequately plan the activity, failure to provide sufficient work controls) for any inconsistencies between intended and actual work activity doses. Focus on those work activities with planned or accrued exposure greater than 5 person-rem.
- e. Determine if post-job (work activity) reviews were conducted and if identified problems were entered into the licensee's corrective action program.

02.03 Verification of Dose Estimates and Exposure Tracking Systems.

- a. Select three to five ALARA work packages and review the assumptions and basis (including dose rate and man-hour estimates) for the current annual collective exposure estimate for reasonable accuracy. Review applicable procedures to determine the methodology for estimating exposures from specific work activities and the intended dose outcome.
- b. Verify for the selected work activities that the licensee has established measures to track, trend, and if necessary to reduce, occupational doses for ongoing work activities. Verify that trigger points or criteria are established to prompt additional reviews and/or additional ALARA planning and controls.
- c. Evaluate the licensee's method of adjusting exposure estimates, or re-planning work, when unexpected changes in scope or emergent work are encountered. Determine if adjustments to exposure estimates (intended dose) are based on sound radiation protection and ALARA principles or if they are just adjusted to account for failures to control the work. Determine whether the frequency of these adjustments call into question the adequacy of the original ALARA planning process.

02.04 Source Term Reduction and Control. Using licensee records, determine the historical trends and current status of significant tracked plant source terms known to contribute to elevated facility aggregate exposure. Determine if the licensee is making allowances or developing contingency plans for expected changes in the source term as the result of changes in plant fuel performance issues or changes in plant primary chemistry.

02.05 Radiation Worker Performance. Observe radiation worker and radiation protection technician performance during work activities being performed in radiation areas, airborne radioactivity areas, or high radiation areas. Concentrate on work activities that present the greatest radiological risk to workers (this review can be performed in concert with the inspection of exposure controls and work coverage in Inspection Procedure 71124.01). Determine if workers demonstrate the ALARA philosophy in practice (e.g., workers are

familiar with the work activity scope and tools to be used, workers use ALARA low-dose waiting areas) and whether there are any procedure compliance issues (e.g., workers are not complying with work activity controls). Also, observe radiation worker performance to determine whether the training and skill level is sufficient with respect to the radiological hazards and the work involved.

02.06 Problem Identification and Resolution. Verify that problems associated with ALARA planning and controls are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance.

## 71124.02-03 INSPECTION GUIDANCE

03.01 Inspection Planning. The level of inspection resources and the number of onsite inspections needed to complete this attachment should be commensurate with the radiological challenge that the licensee is experiencing. The quartile standing of the licensee's TYRA is used to assess the current level of challenge to the licensee's program. In general, licensees whose TYRA collective dose is in the lowest quartile, when compared to reactors of the same type (e.g., PWR or BWR), should be assigned the minimum inspection hours. The Office of Nuclear Reactor Regulation will calculate and disseminate plant quartile information for both pressurized-water reactors (PWRs) and boiling-water reactors (BWRs) to the regions on an annual basis. Licensees in the highest quartile should be assigned the maximum inspection hours. However, factors such as the anticipated scope of upcoming radiological work and noted trends in performance may also be considered in determining the level of inspection resources.

- a. The regulation in 10 CFR 20.2206(c) requires that, by April 30 of each year, licensees submit to the NRC an annual report containing the results of individual monitoring carried out by the licensee for the previous year's collective exposure. The individual plant collective exposures, along with the TYRA collective exposure for each operating commercial nuclear plant, are contained in NUREG-0713. The inspector should use the most recent annual collective exposure data available for calculating the TYRA collective exposure (if the licensee has submitted its 10 CFR 20.2206(c) report for the previous year, the inspector should use the site data to calculate the TYRA collective exposure if the report is more recent than the data contained in the latest NUREG-0713 report). For single-unit sites on a 24-month refueling outage cycle, the TYRA used to schedule inspection hours should be for the most recent year in which the plant had a refueling outage.
- b. Based on Electric Power Research Institute (EPRI) TR-108737, the average BWR source term is 220 millirem/hour (mrem/h). Based on EPRI TR-107566, "Evaluation of PWR Radiation Fields : 1991-1996," issued February 1997, the average PWR source term is 100 mrem/h. "Source term" as defined by EPRI means average contact dose rate with the vertical recirculation piping (for BWRs)

and with the crossover loop elbow near the reactor coolant pump piping (Standard Radiation Monitoring Point C5) for PWRs.

### 03.02 Radiological Work Planning.

- a. A work activity is one or more closely related tasks that the licensee has reasonably grouped together as a unit of work for the purpose of ALARA planning and work controls. The effectiveness of a licensee's ALARA program is assessed by comparing the outcomes (in terms of collective dose) to the dose that was intended (i.e., determined to be ALARA) for individual work activities.

Focus on work activities that accrued dose significantly greater than projected and approached or exceeded the ALARA significance determination process thresholds (5 rem collective with 50 percent overage).

A work activity may have benefited from proper ALARA radiological work planning, yet exceeded its intended dose outcome because of unplanned and/or unexpected conditions or emergent work. Although the pressures of outage scheduling may impact the determination of what additional controls and other measures are reasonably achievable, the licensee is still required to manage these activities such that the resulting doses are ALARA. Occurrences of this type should be entered into the licensee's corrective action program for a determination of whether these dose overruns were avoidable, and the appropriate licensee organization(s) should be held accountable for these breakdowns in work planning. Although 10 CFR Part 20, "Standards for Protection against Radiation," does not require licensees to make every possible effort to demonstrate optimized exposure performance, a high frequency of these ALARA deficiencies may indicate a deficiency in the licensee's overall ALARA program in terms of the ability of different work groups (e.g., operations, radiation protection, maintenance, outage planning) to interface effectively with each other.

- b. For licensees in the high collective dose quartile with work activity dose that significantly exceeds projections, consider evaluating the following:
  1. the interfaces between operations, radiation protection, maintenance, maintenance planning, scheduling and engineering groups for interface problems or missing program elements
  2. the shielding requests generated by the RP group with respect to dose rate reduction problem definition and assigning value (dose savings or dollars); engineering shielding responses for follow through
  3. whether work activity planning considers the benefits of dose rate reduction activities such as shielding provided by water-filled components/piping, job scheduling, and shielding and scaffolding installation and removal activities

### 03.03 Verification of Exposure Estimate and Exposure Tracking Systems.

- a. The ability to determine if doses for a work activity are ALARA, or whether they need to be reduced further, will often depend on the accuracy of exposure estimates made in the planning process. These exposure estimates should be based on good assumptions and correct calculations with some flexibility allowed for the expected variability caused by the limits of forecasting.

Accurate exposure estimates usually require a detailed task analysis of the work activity. However, in cases of routine activities, the licensee may rely on previous experience to establish the intended dose and reasonable work controls, in lieu of detailed analysis. Look for bottom-up (aggregation of individual task estimates) exposure estimates corroborated by top-down (historical work activity dose rate times work activity duration) estimating methods. Use of past outage experience combined with additional industry experience can provide a reasonable exposure estimate approach.

If exposure estimates appear questionable, use site-specific experience as the primary standard of comparison, and utilize industry data (as available) or actual work activity exposure data as a secondary standard of comparison to determine the reasonableness of licensee exposure estimates.

- b. For licensees in the high collective dose quartile with a work activity dose that significantly exceeds projections, review the licensee's exposure tracking system. Determine whether the level of exposure tracking detail, exposure report timeliness, and exposure report distribution is sufficient to support control of collective exposures. For example, do RWPs cover too many work activities to allow work activity specific exposure trends to be detected and controlled? During the conduct of exposure-significant maintenance work, look for evidence that licensee management was aware of the exposure status of the work and would intervene if exposure trends increased beyond exposure estimates.

### 03.04 Source Term Reduction and Control.

- a. Radiation source term is the level of radiation, or radioactive material, given off by, or contained in, plant systems, structures, or components that results in occupational radiation exposure from the routine operation, including anticipated operational occurrences, of the plant. The radiation source term can result from activated components in primary containment; corrosion and wear products (CRUD) activated in the reactor and distributed to plant systems; or sealed sources maintained on site to support operations.

Source term reduction measures include chemistry controls to reduce CRUD; proper shutdown/cool-down evolution to control CRUD release and cleanup; appropriate work planning to maximize the benefit of radioactive decay of short-lived radionuclides; cleanup of contaminated systems; and the application of

additional shielding afforded either by the system/component (e.g., having system components filled with water where that lowers the dose rates in work areas) or by use of temporary, portable shielding.

- b. For licensees in the high collective dose quartile where actions taken to reduce the source term have been ineffective, determine if followup evaluations and additional actions have been planned. If not, look for additional examples to establish whether there is a pattern.
  1. Determine if the licensee has developed an understanding of the plant source term, including knowledge of input mechanisms to reduce the source term.
  2. Determine whether the licensee has a source term control strategy in place. This should include a cobalt reduction strategy and shutdown ramping and operating chemistry plan (designed to minimize the source term external to the core) as a minimum. Other methods to control the source term would include preconditioning of primary system surfaces, component and system decontamination, and use of shielding. Some source term control strategies may not be applicable to certain plants. If the licensee does not have a source term control strategy in place, look for reasonable justifications for not pursuing such exposure reduction initiatives.
  3. If the licensee has a source term control strategy in place, determine if specific sources have been identified by the licensee for exposure reduction actions and what priorities the licensee has established for implementation of these actions. Determine what results have been achieved against these priorities since the last refueling cycle. Review any applicable design modifications (such as hydrogen injection) associated with source term reduction. Determine if modification is achieving the desired source term reduction.
  4. During the current biennial assessment period, determine whether source reduction evaluations have been made and actions have been taken to reduce the overall source term compared to the previous year.
  5. Review planned or implemented modifications associated with permanent installation of shielding or shielding racks. Verify that controls are in place to measure the effectiveness of dose reduction.

03.05 through 03.06 No inspection guidance provided.

For applicable guidance on 10 CFR 20.1101(c) compliance, see Questions and Answers 118, 134, and 380 in NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20," dated May 1, 1994.

71124.02-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take, on average, 54 hours biennially to perform the requirements of this attachment. Normally, a minimum of 44 hours should be assessed for plants appearing in the top (lowest dose) quartile of the plant ranking based on TYRA collective dose. A maximum of 64 hours should be assessed for the plants appearing in the bottom (highest dose) quartile. The plants in the second and third quartiles should receive an average of 54 inspection hours biennially. Adjustments to these inspection hours can be made (either an increase or decrease of hours within the range of 44 to 64 hours), based on the source term and overall effectiveness of a licensee's previous and ongoing ALARA and source term reduction efforts.

71124.02-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP 71124.02

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810389

## ATTACHMENT 71124.03

INSPECTABLE AREA: In-Plant Airborne Radioactivity Control and Mitigation

CORNERSTONE: Occupational Radiation Safety

EFFECTIVE DATE: January 1, 2010

INSPECTION BASIS: Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation," Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas," requires licensees to use, to the extent practical, process or other engineering controls to control the concentration of radioactivity in air. If engineering controls alone are not able to maintain airborne concentrations of radionuclides below those defined as an airborne radioactive area (as defined in 10 CFR Part 20), then licensees must take other actions, consistent with the as low as reasonably achievable (ALARA) principles, to limit the intake of these radionuclides. The use of a respiratory protection device is one of the optional measures to limit intake. This inspectable area is partially covered by the Occupational Radiation Safety Performance Indicator (PI) in that the improper control of airborne radioactive materials, or ineffective measures to limit intake of these airborne materials, could result in unintended committed effective dose reportable per the definition of the PI. However, the risk associated with work activities that have significant potential for an acute intake may not be reflected in the resulting dose. In addition, the use of a respiratory protection device can pose a risk to the health and safety of the wearer that is not a function of the resultant dose and is not covered by the PI. The regulation in 10 CFR 20.1703, "Use of Individual Respiratory Protection Equipment," provides several requirements for the use of respiratory protection devices to minimize the risk to the health of the wearer from the respiratory protection device itself.

LEVEL OF EFFORT: Inspect biennially

ENCLOSURE 5

## 71124.03-01 INSPECTION OBJECTIVES

To verify that in-plant airborne concentrations are being controlled consistent with ALARA to the extent necessary to validate plant operations as reported by the PI and to verify that the practices and use of respiratory protection devices on site do not pose an undue risk to the wearer.

## 71124.03-02 INSPECTION REQUIREMENTS

02.01 Inspection Planning. Review the plant final safety analysis report (FSAR) to identify areas of the plant designed as potential airborne radiation areas and any associated ventilation systems or airborne monitoring instrumentation. Instrumentation may include continuous air monitors (continuous air monitors and particulate-iodine-noble-gas-type instruments) or other monitors used to identify changing airborne radiological conditions such that actions to prevent an overexposure may be taken. Review FSAR for overview of respiratory protection program and a description of the types of devices used. Review FSAR, technical specifications, and emergency planning documents to identify location and quantity of respiratory protection devices stored for emergency use.

Review the licensee's procedures for maintenance, inspection, and use of respiratory protection equipment including self-contained breathing apparatus (SCBA). Additionally, review procedures for air quality maintenance.

Review the reported PIs to identify any related to unintended dose resulting from intakes of radioactive materials.

### 02.02 Engineering Controls.

- a. Ventilation, permanent and temporary—Verify that the licensee uses ventilation systems as part of its engineering controls (in lieu of respiratory protection devices) to control airborne radioactivity. Review procedural guidance for use of installed plant systems, such as containment purge, spent fuel pool ventilation, and auxiliary building ventilation, and verify that the systems are used, to the extent practicable, during high-risk activities (e.g., using containment purge during cavity floodup).

Select, as available, one to two installed ventilation systems used to mitigate the potential for airborne radioactivity, and verify that ventilation airflow capacity, flow path (including the alignment of the suction and discharges), and filter/charcoal unit efficiencies are consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable.

Select, as available, one to two temporary ventilation system setups high-efficiency particulate air (HEPA)/charcoal negative pressure units, downdraft tables, tents, metal "Kelly buildings," and other enclosures used to support work in contaminated

areas. Verify that the use of these systems is consistent with licensee procedural guidance and ALARA.

- b. Airborne monitoring protocols—Select one to two installed systems to monitor and warn of changing airborne concentrations in the plant. Verify that alarms and setpoints are sufficient to prompt licensee/worker action to ensure that doses are maintained within the limits of 10 CFR Part 20 and ALARA.

Verify that licensees have established trigger points (e.g., the Electric Power Research Institute's "Alpha Monitoring Guidelines for Operating Nuclear Power Stations") for evaluating levels of airborne beta-emitting (e.g., plutonium-241) and alpha-emitting radionuclides.

#### 02.03 Use of Respiratory Protection Devices.

- a. ALARA—For those situations where it is impractical to employ engineering controls to minimize airborne radioactivity, verify that the licensee provides respiratory protective devices such that occupational doses are ALARA. As available, select one to two work activities where respiratory protection devices are used to limit the intake of radioactive materials, and verify that the licensee performed an evaluation concluding that further engineering controls are not practical and that the use of respirators is ALARA. Verify that the licensee has established means (such as routine bioassay) to verify that the level of protection (protection factor) provided by the respiratory protection devices during use is at least as good as that assumed in the licensee's work controls and dose assessment.
- b. Certified equipment—Verify that respiratory protection devices used to limit the intake of radioactive materials are certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) or have been approved by the NRC per 10 CFR 20.1703(b). As available, select one to two work activities where respiratory protection devices are used. Verify that the devices are used consistent with their NIOSH/MSHA certification or any conditions of their NRC approval.
- c. Air quality and quantity—Review records of air testing for supplied-air devices and SCBA bottles. Verify that air used in these devices meets or exceeds Grade D quality. Verify that plant breathing air supply systems meet the minimum pressure and airflow requirements for the devices in use.
- d. Medical determination—Select three to five individuals qualified to use respiratory protection devices, and verify that they have been deemed fit to use the device(s) by a physician. **DO NOT REQUEST OR REVIEW WORKERS' PERSONAL MEDICAL RECORDS.**
- e. User performance—As available, select three to five individuals assigned to wear a respiratory protection device and observe them donning, doffing, and functionally checking the device as appropriate. Verify through interviews with these individuals

that they know how to safely use the device and how to properly respond to any device malfunction or unusual occurrence (loss of power, loss of air, etc.). If in-field observations are limited, review training curricula for users of the devices, and/or request a demonstration of device use from one to three selected individuals.

- f. Equipment storage, maintenance, and quality assurance—Choose 5 to 10 respiratory protection devices staged and ready for use in the plant or stocked for issuance for use. Observe the physical condition of the device components (mask or hood, harnesses, air lines, regulators, air bottles, etc.) and review records of routine inspection for each. Select one to three of the devices, and review records of maintenance on the vital components (e.g., pressure regulators, inhalation/exhalation valves, hose couplings). Verify that onsite personnel assigned to repair vital components have received vendor-provided training.

02.04 Self-Contained Breathing Apparatus for Emergency Use. In addition to the inspection requirements of Section 02.03 above, verify the following for SCBAs designated for emergency use.

- a. Based on FSAR, technical specifications, and emergency operating procedure requirements, review the status and surveillance records of three to five SCBAs staged in-plant for use during emergencies. Inspect the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions.
- b. Select at least three individuals on control room shift crews, and at least three individuals from designated departments currently assigned emergency duties (e.g., onsite search and rescue duties). Determine if control room operators and other emergency response and radiation protection personnel (assigned in-plant search and rescue duties or as required by emergency operating procedures or the emergency plan) are trained and qualified in the use of SCBAs (including personal bottle changeout). Determine if personnel assigned to refill bottles are trained and qualified for that task.
- c. Verify that appropriate mask sizes and types are available for use (in-field mask size and type should match what was used in fit-testing). Select two to three on-shift operators, and verify that they have no facial hair that would interfere with the sealing of the mask to the face. Also verify that vision correction that does not penetrate the face seal (e.g., glasses inserts or corrected lenses) is available as appropriate.
- d. In addition to the inspection in 02.03.f above, review the past 2 years of maintenance records for two to three SCBA units used to support operator activities during accident conditions and designated as "ready for service." Verify that any maintenance or repairs on an SCBA unit's vital components were performed by an individual, or individuals, certified by the manufacturer of the device to perform the work. These vital components typically are the pressure-demand air regulator and the low-pressure alarm. Review the onsite maintenance procedures governing vital

component work, and identify any inconsistencies with the SCBA manufacturer's recommended practices. For those SCBAs designated as "ready for service," ensure that the required, periodic air cylinder hydrostatic testing is documented and up to date, and the retest air cylinder markings required by the U.S. Department of Transportation are in place.

02.05 Problem Identification and Resolution. Verify that problems associated with the control and mitigation of in-plant airborne radioactivity are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance. (optional) In addition to the above, verify the appropriateness of the corrective actions for a selected sample of problems involving airborne radioactivity and documented by the licensee.

## 71124.03-03 INSPECTION GUIDANCE

### 03.01 Inspection Planning.

No inspection guidance provided.

### 03.02 Engineering Controls.

- a. During plant tours, be alert to plant ventilation flow problems that may result in airborne radioactivity moved by incorrect flows from elevated airborne radioactivity areas to nonairborne radioactivity areas.

The focus of this inspection item is to verify that the licensee is using, to the extent practicable, engineering controls in lieu of respiratory protection. The effectiveness of the in-field use of temporary containment/ventilation is inspected according to Inspection Procedure 71124.01.

- b. Improperly maintained and controlled vacuum cleaners have been the source of elevated airborne radioactivity events. Licensees should have a program to ensure that the vacuum cleaners are maintained and do not present an unevaluated source of airborne radioactivity.

The licensee's program for airborne radioactivity controls should consider "sleeping alpha" emitters that have been incorporated into plant piping corrosion layers or other areas of the plant from a previous failed fuel event and may be released during grinding, welding, or other work activities generating airborne radioactivity.

- c. No inspection guidance provided.

### 03.03 Use of Respiratory Protection Devices.

- a. The level of detail and scope of the licensee's ALARA determination should be commensurate with the radiological hazards (both air borne and external, direct radiation exposure). These evaluations may also consider factors other than the exposure to radioactive materials (such as worker acceptance, contamination control, heat stress, and exposure to other Occupational Safety and Health Administration hazards).
- b. Several licensees have obtained NRC approval to use non-NIOSH-approved respiratory protection devices. Examples of these include the Mine Safety Appliance GRM-I canister for radioiodine adsorption/filtration, and several models of the Delta Protection air-supplied and powered air purifying suits. The inspector should refer to the Office of Nuclear Reactor Regulation safety evaluations issued with these specific approvals for licensee commitments and conditions of use for these devices.

NIOSH certification (or NRC approval) is required for all respiratory protection devices used to limit intake of radioactive material (10 CFR 20.1703). It is the NRC's position that any respiratory protection device used in a contaminated area or potentially contaminated area (i.e., inside the radiation control area) is, by definition, being used to limit intake of radioactive material. This is true regardless of whether the licensee is taking credit for the respirators' applied protection factor.

A general Certified Equipment List is published by NIOSH on its Web site at <http://www.cdc.gov/niosh/npptl/topics/respirators/cel/default.html>. Respirators and equipment (e.g., filter canisters) certified by NIOSH must have a label attached with a certification number (TC-#). The TC-# is unique to the specific configuration and application of the respirator. Use of replacement parts not listed under the NIOSH published TC-# voids the certification, even if those parts are certified for use for another respirator.

- c. The air intake for compressors servicing breathing air supplies should be controlled and/or monitored by the licensee to ensure that fumes or other contaminants (e.g., toxic vapors from cleaning fluids, nitrogen/Halon fire suppression systems, or diesel engine exhaust) cannot be introduced into the breathing air.

Criteria for Grade D air are defined by the Compressed Gas Association in publication G-7.1, "Commodity Specification for Air," issued in 1997, as referenced in 10 CFR 20.1703(g).

- d. Medical physicals and tests can be administered by a nonphysician medical practitioner. The medical practitioner may even sign the documentation that the subject has passed the physical. However, the tests administered, their pass criteria, and the basis for judging the individual fit to use a respirator should be established by a licensed physician.

- e. Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," and NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Material," Revision 1, issued January 2001, contain technical guidance on types of respiratory protection devices and all other aspects of a respiratory protection program. The inspector should determine to what extent deficiencies in this area indicate deficiencies in the licensee's respiratory protection training and cross-cutting issues in the human performance area.
- f. The level of quality assurance should be commensurate with the safety significance of the respirator application. The inspector should verify that appropriate implementation of safety-significant elements of the respiratory program (e.g., fit-testing, training, providing a standby rescue person, and equipment configuration) is reviewed for SCBAs and respirators used in low-oxygen or other atmospheres immediately deleterious to life and health. Paint coatings on SCBA air bottles are designed to indicate potential damage to the bottle from overheating.

03.04 Self-Contained Breathing Apparatus for Emergency Use In general, the inspection should focus on use of SCBAs for radiological emergency response and not on fire brigade equipment. There may be some areas of overlap, however. For example, fire brigade procedures for inventory and maintenance of SCBAs may also include units staged for use in radiological emergencies. Any issues that arise regarding fire brigade equipment should be discussed with fire protection inspectors in the regional office.

- a. For recent examples of licensee problems in this area, refer to NRC Information Notice (IN) 98-20, "Problems with Emergency Preparedness Respiratory Protection Programs," dated June 3, 1998, and IN 99-05, "Inadvertent Discharge of Carbon Dioxide Fire Protection System and Gas Migration," dated March 8, 1999. These two INs summarize the recent industry problems with qualification of respirator users, shortcomings in training, inadequate evaluations of emergency conditions and impact on control room operators, and other problems. Inspection findings in this area note shortcomings in control room operator training, which focuses on lack of adequate hands-on training (e.g., no practice in changing air cylinders). Note that 10 CFR 20.1703(c)(4) requires respiratory training, and Regulatory Guide 8.15 (Revision 1), Section 5.2, describes the staff's position in this area (e.g., user training should include hands-on training and should demonstrate competency in donning, using, and removing the device).
- b. It may be necessary to request that the licensee demonstrate SCBA bottle changeout to ensure that the licensee's training program maintains this capability.
- c. SCBA fit-testing is more safety significant than respirator fit-testing in general. Use of a poorly fitting SCBA can result in excessive air leakage from the face covering. Such leakage can significantly reduce the service life of the SCBA bottled air supply and jeopardize the mission of the wearer, as well as his or her personal safety.
- d. See pertinent sections of Regulatory Guide 8.15 (Revision 1) and NUREG-0041 (Revision 1) for current staff guidance on SCBA acceptable maintenance training,

practices, and activities for vital respirator components. The respirator manufacturer (vendor) provides required written literature, as well as Web sites on specific SCBA use and maintenance/repair, specifying required surveillances to ensure continued unit operability. Discuss any differences between the vendor's and the licensee's procedures and practices, and determine the potential impact of these differences on unit operability/NIOSH certification.

### 03.05 Problem Identification and Resolution.

No inspection guidance provided.

#### 71124.03-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 16 hours, on average (with a range of 12 to 20 hours), to perform the requirements of this attachment.

#### 71124.03-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP 71124.03

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810396

## ATTACHMENT 71124.04

INSPECTABLE AREA: Occupational Dose Assessment

CORNERSTONE: Occupational Radiation Safety

EFFECTIVE DATE: January 1, 2010

INSPECTION BASIS: In the radiation safety area, dose is the basic measure of risk from occupational radiation exposures. The ability to provide for adequate protection of the worker rests on effective risk assessment, which is dependent on the application of monitoring and dosimetry techniques appropriate for the exposure situation. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation," Subpart F, "Surveys and Monitoring," contains provisions for individual monitoring of external and internal exposures, as well as requirements for the calibration and accuracy of dosimetry equipment. In addition, 10 CFR 20.1202, "Compliance with Requirements for Summation of External and Internal Doses," has requirements for summing external and internal exposures to determine the total effective dose equivalent. This inspectable area verifies aspects of the Occupational Radiation Safety Cornerstone for which there are no indicators to measure performance.

LEVEL OF EFFORT: Inspect biennially

### 71124.04-01 INSPECTION OBJECTIVES

To (1) determine the accuracy and operability of personal monitoring equipment, (2) determine the accuracy and effectiveness of the licensee's methods for determining total effective dose equivalent, and (3) ensure that occupational dose is appropriately monitored.

ENCLOSURE 6

02.01 Inspection Planning.

- a. Review the results of radiation protection program audits related to internal and external dosimetry (e.g., licensee's quality assurance (QA) audits, self-assessments, or other independent audits). The results of the reviews should be used to gain insights into overall licensee performance in the area of dose assessment and focus the inspector's activities consistent with the principle of "smart sampling."
- b. Review the most recent National Voluntary Laboratory Accreditation Program (NVLAP) accreditation report on the licensee or, if dosimetry is provided by a vendor, review the vendor's most recent results to determine the status of the licensee's or contractor's accreditation.
- c. Review licensee procedures associated with dosimetry operations, including issuance/use of external dosimetry (routine, multibadging, extremity, neutron, etc.), assessment of internal dose (operation of whole body counter, assignment of dose based on derived air concentration (DAC)-hours, urinalysis, etc.), and evaluation of and dose assessment for radiological incidents (distributed contamination, hot particles, loss of dosimetry, etc.).
- d. Verify that the licensee has established procedural requirements for determining when external and internal dosimetry is required.

02.02 External Dosimetry.

## a. NVLAP Accreditation

Verify that the licensee's personnel dosimeters that require processing are NVLAP accredited. If dosimeters are provided by a vendor, verify the vendor's NVLAP accreditation. Ensure that the approved irradiation test categories for each type of personnel dosimeter used (thermoluminescent dosimeter (TLD), optically stimulated luminescent (OSL), diethyl glycol bisalil carbonate (CR-39), etc.) are consistent with the types and energies of the radiation present, and the way that the dosimeter is being used (e.g., to measure deep dose equivalent (DDE), shallow dose equivalent (SDE), or LDE).

## b. Passive Dosimeters (TLD, OSL, Bubble Dosimeters)

1. Evaluate the onsite storage of dosimeters before their issuance, during use, and before processing/reading. If the licensee does not require issued dosimetry to be stored on site during the wear period, verify that guidance is provided to rad-workers with respect to care and storage of dosimeters.

2. For non-NVLAP accredited passive dosimeters (e.g., bubble dosimeters, direct ion storage), verify that licensee procedures or processes provide for periodic calibration, application of calibration factors, usage, reading (dose assessment), zeroing, etc.

c. Active Dosimeters (Electronic Dosimeters)

1. Determine if the licensee uses a "correction factor" to address the response of the electronic dosimeter (ED) as compared to TLD/OSL for situations when the ED must be used to assign dose. Verify that the correction factor is based on sound technical principles.
2. As part of the problem identification and resolution review in 02.05 below, select three to five (as available) dosimetry occurrence reports or corrective action program documents for adverse trends related to electronic dosimeters, such as interference from electromagnetic frequency, dropping or bumping, failure to hear alarms, etc. Determine if the licensee has identified any trends and implemented appropriate corrective actions.

02.03 Internal Dosimetry.

a. Routine Bioassay (in vivo)

1. To the extent not covered in 02.01 above, review procedures used to assess dose from internally deposited radionuclides using whole body counting equipment. Verify that the procedures address methods for determining if an individual is internally or externally contaminated, the release of contaminated individuals, the determination of entry route (ingestion, inhalation), and assignment of dose.
2. If whole body counting is used to routinely verify, or quantify, the intakes of radionuclides (i.e., following the entry into a high airborne area, or following the use of respiratory protection equipment), verify that the frequency of such measurements is consistent with the biological half-life of the potential nuclides available for intake.
3. If the licensee uses a method other than whole body counting for screening intakes (e.g., passive monitoring using portal monitors), evaluate the minimum detectable activity (MDA) of the instrument. Determine if the MDA is adequate to determine the potential for internally deposited radionuclides sufficient to prompt additional investigation.
4. Select three to five whole body counts and verify that the system used in each had sufficient counting time/low background to ensure appropriate sensitivity for the potential radionuclides of interest. Verify that the appropriate nuclide library was used. Verify that any anomalous count peaks/nuclides indicated in each output spectra received appropriate disposition. Review the licensee's

10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," analyses to ensure that the libraries include appropriate gamma-emitting nuclides. If the licensee relies solely on whole body counting for assessing internal dose, determine how hard-to-detect nuclides are accounted for in the dose assessment.

b. Special Bioassay (in vitro)

1. Select one to two, as available, internal dose assessments obtained using in vitro monitoring. Review and assess the adequacy of the licensee's program for in vitro monitoring (i.e., urinalysis and fecal analysis) of radionuclides (tritium, fission products, and activation products), including collection and storage of samples.
2. For the dose assessments selected in 02.03.b.1. above, review the counting lab's QA program or, if a vendor lab is used, the licensee's audits of the lab. Verify that the lab participates in an analysis cross-check program and that out-of-tolerance results are evaluated and resolved appropriately.

c. Review and assess the adequacy of the licensee's program for dose assessments based on airborne/DAC monitoring. Verify that flow rates and/or collection times for fixed head air samplers or lapel breathing zone air samplers are adequate to ensure that appropriate lower limits of detection (LLDs) are obtained. Review the adequacy of procedural guidance used to assess dose when, if using respiratory protection, the licensee applies protection factors. Review one to two dose assessments performed using airborne/DAC monitoring, if available. Verify that the licensee's DAC calculations are representative of the actual airborne radionuclide mixture, including hard-to-detect nuclides, as appropriate. Note that requirements in this section may overlap requirements in Inspection Procedure (IP) 71124.01 and IP 71124.03. Try to avoid duplication of effort to the extent possible.

d. Review and assess the adequacy of the licensee's internal dose assessments for any actual internal exposure greater than 10 millirem committed effective dose equivalent (limit these assessments to no more than two intake events with similar radionuclide mixes). Determine if the affected personnel were properly monitored with calibrated equipment and if the data were analyzed and internal exposures properly assessed in accordance with licensee procedures.

02.04 Special Dosimetric Situations.

a. Declared Pregnant Workers

1. Verify that the licensees inform workers, as appropriate, of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for (voluntarily) declaring a pregnancy.

2. Select one to two individuals (as available) who have declared their pregnancy during the current assessment period, and verify that the licensee's radiological monitoring program (internal and external) for declared pregnant workers is technically adequate to assess the dose to the embryo/fetus. Review the exposure results and monitoring controls employed by the licensee and with respect to the requirements of 10 CFR Part 20.
- b. Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures
1. Review the licensee's methodology for monitoring external dose in situations in which nonuniform fields are expected or large dose gradients will exist (e.g., diving activities and steam generator jumps). Verify that the licensee has established criteria for determining when alternate monitoring techniques (i.e., use of multibadging or determination of effective dose equivalent for external exposures (EDEX) using an approved method) are to be implemented.
  2. Review one to two dose assessments performed using multibadging during the current assessment period. Verify that the assessment was performed consistently with licensee procedures and dosimetric standards.
- c. Shallow Dose Equivalent
1. Review one to two SDE dose assessments for adequacy. Evaluate the licensee's method (e.g., VARSKIN or similar code) for calculating SDE from distributed skin contamination or discrete radioactive particles.
- d. Neutron Dose Assessment
1. As appropriate, evaluate the licensee's neutron dosimetry program, including dosimeter type(s) and/or survey instrumentation.
  2. As available, select one to two neutron exposure situations (e.g., independent spent fuel storage installation operations or at-power containment entries) and verify that (a) dosimetry and/or instrumentation is appropriate for the expected neutron spectra, (b) there is sufficient sensitivity for low dose and/or dose rate measurement, and (c) neutron dosimetry is properly calibrated. Verify that interference by gamma radiation has been accounted for in the calibration. Verify that time and motion evaluations are representative of actual neutron exposure events, as applicable.
- e. For the special dosimetric situations reviewed in this section, determine how the licensee assigns dose of record for total effective dose equivalent, SDE, and LDE. This should include assessment of external and internal monitoring results, supplementary information on individual exposures (e.g., radiation incident

investigation reports and skin contamination reports), and radiation surveys and/or air monitoring results when dosimetry is based on these techniques.

02.05 Problem Identification and Resolution. Verify that problems associated with occupational dose assessment are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. In addition, verify the appropriateness of the corrective actions for a selected sample of problems documented by the licensee involving occupational dose assessment.

#### 71124.04-03 INSPECTION GUIDANCE

03.01 Inspection Planning. No guidance provided.

03.02 External Dosimetry.

- a. Review NVLAP test results for outliers, bias in the measurements, or angular response issues. Determine if the licensee has entered these concerns into the corrective action program and whether the corrective actions are appropriate. If dosimetry is provided by a vendor, determine if licensee audits of the vendor lab assessed the NVLAP test results and performance and any necessary corrective actions. American National Standards Institute (ANSI) N13.11-2001, "Personnel Dosimetry Performance—Criteria for Testing," presents additional guidance.
- b. See guidance in Information Notice 85-81, "Problems Resulting in Erroneously High Reading with Panasonic 800 Series Thermoluminescent Dosimeters," dated October 17, 1985.
- c. See guidance in NUREG/CR-6581, "Considerations in the Application of the Electronic Dosimeter to Dose of Record," issued December 1997.

03.03 Internal Dosimetry.

- a. See guidance in ANSI N13.30-1996, "Performance Criteria for Radiobioassay."
- b. Verify that the licensee's sample collection procedures ensure the following:
  1. collection and preservation of samples in a manner such that the loss of activity on the walls of the container is minimal and sample contamination is prevented,
  2. a sample of adequate size for each type of analysis requested, including adequate amounts to allow verification or additional analysis if needed,
  3. containers that are free of external and internal contamination,

4. precautions to ensure the integrity of the container and prevent leakage from the container and/or cross-contamination of samples during the shipment and storage of samples, and
  5. accurate and unambiguous identification of samples. In addition, the licensee should specify the required LLDs and the reporting requirements, including standard error or confidence interval estimates, and alert the service laboratory of potentially "highly contaminated" samples, samples that may contain additives and/or preservatives, or samples that may contain extremely insoluble material.
- c. No guidance provided.
  - d. No guidance provided.

03.04 Special Dosimetry Situations.

- a. See the guidance in Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus," and Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure."
- b. See the guidance on several NRC-approved methods for assessing EDEX contained in Regulatory Issue Summary (RIS) 2003-04, "Use of the Effective Dose Equivalent in Place of the Deep Dose Equivalent in Dose Assessments," dated February 13, 2003; RIS 2004-01, "Method for Estimating Effective Dose Equivalent from External Radiation Sources Using Two Dosimeters," dated February 17, 2004; RIS 2009-09, "Use of Multiple Dosimetry and Compartment Factors in Determining Effective Dose Equivalent From External Radiation Exposures," dated July 13, 2009; and Draft Regulatory Guide DG-8039, "Methods for Estimating Effective Dose Equivalent from External Exposure."
- c. SDE must be the dose averaged over the 10 square centimeters of skin receiving the highest exposure. This should combine contributions from distributed skin contamination, gamma contributions from clothing contamination (if significant), as well as Discrete Radioactive Particles (DRPs), into one dosimetric quantity. If licensees are keeping track of DRP dose separately from SDE, then they are not meeting the intent of the 2002 rule change to SDE evaluation. See the *Federal Register* notice dated April 5, 2002 (67FR16304), for a more detailed discussion.

Verify that the licensee has established procedures for wound monitoring, and dose assessment from imbedded sources. Verify that clear criteria have been established for releasing from the site personnel with imbedded radioactive particles.

- d. See guidance on neutron dosimeters in ANSI N13.52-1999, "Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV)."

- e. See the guidance in ANSI N13.6-1999, "Practice for Occupational Radiation Exposure Records Systems."

03.05 Problem Identification and Resolution.

See IP 71152, "Identification and Resolution of Problems," for additional guidance.

71124.04-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 20 hours, on average (with a range of 12 to 28 hours) to perform the requirements of this attachment.

71124.04-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP 71124.04

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 Reactor Oversight Process IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810401

## ATTACHMENT 71124.05

INSPECTABLE AREA: Radiation Monitoring Instrumentation

CORNERSTONES: Occupational Radiation Safety 50%  
Public Radiation Safety 50%

EFFECTIVE DATE: January 1, 2010

INSPECTION BASIS: Protection of personnel involved in plant operations or work activities associated with transient high and very high radiation areas, or areas with airborne radioactivity, depends on the accuracy, operability, and proper use of radiation monitoring instruments. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation," Subpart F, "Surveys and Monitoring," requires that surveys are made to demonstrate compliance with 10 CFR Part 20; are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations, or quantities of radioactive materials; and the potential radiological hazards. In addition, paragraph (b) of Subpart F requires that instruments and equipment used for quantitative radiation measurements be calibrated periodically for the radiation measured. Monitoring for radiation that may be released from normal operations, including anticipated operational occurrences, and postulated accidents is required by Criterion 64, "Monitoring Radioactivity Releases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Proper operation of these monitoring systems ensures adequate protection of members of the public against an unmonitored, unanticipated, and unplanned discharge of radioactive material to the environment. This inspectable area verifies aspects of the Radiation Protection Program for which there are no indicators to measure performance.

LEVEL OF EFFORT: Inspect biennially

ENCLOSURE 7

## 71124.05-01 INSPECTION OBJECTIVES

To verify that the licensee is ensuring the accuracy and operability of radiation monitoring instruments that are used to (1) monitor areas, materials, and workers to ensure a radiologically safe work environment and (2) detect and quantify radioactive process streams and effluent releases. The instrumentation subject to this review includes equipment used to monitor radiological conditions incident to normal plant operations, including anticipated operational occurrences, and conditions resulting from postulated accidents.

## 71124.05-02 INSPECTION REQUIREMENTS

To the extent possible, perform in-office preparation before the onsite effort, as indicated below and complete the remaining inspection planning and follow up actions during the onsite aspects of the inspection.

### 02.01 Inspection Planning.

- a. Review the plant final safety analysis report (FSAR) to identify radiation instruments associated with monitoring areas radiological conditions including airborne radioactivity, process streams, effluents, materials/articles, and workers. Additionally, identify instrumentation and associated technical specification requirements for postaccident monitoring instrumentation, including those instruments used for remote emergency assessment.

Be familiar with FSAR commitments and technical specification requirements for these instruments. If the postaccident sampling system has been eliminated from the technical specifications as required instrumentation, its review is not necessary.

- b. Obtain a listing of in-service survey instrumentation including air samplers and small article monitors (SAMs), along with instruments used for detecting and analyzing workers' external contamination (personnel contamination monitors (PCMs)) and workers' internal contamination (portal monitors (PMs), whole body counters (WBCs), etc.). Neutron monitoring instrumentation should be included in the list. Review the list to determine whether an adequate number and type of instruments are available to support operations.
- c. Obtain copies of licensee and third-party (independent) evaluation reports of the radiation monitoring program since the last inspection, including audits of the licensee's offsite calibration facility (if applicable). Review the reports for insights into the licensee's program and to aid in selecting areas for review ("smart sampling").
- d. Obtain copies of the procedures that govern instrument source checks and calibrations. Focus on instruments used for monitoring transient high radiological conditions, including instruments used for underwater surveys. Review the

calibration and source check procedures for adequacy and as an aid to smart sampling in preparation for the onsite inspection.

- e. Review the area radiation monitor (ARM) alarm setpoint values and setpoint bases as provided in the technical specifications and the FSAR in preparation for the onsite inspection.
- f. Review effluent monitor alarm setpoint bases and the calculational methods provided in the offsite dose calculation manual (ODCM).

#### 02.02 Walkdowns and Observations.

- a. Walk down three to five effluent radiation monitoring systems (consistent with smart sampling). Include at least one liquid and one airborne system. Focus on any flow measurement devices and all accessible point-of-discharge liquid and gaseous effluent monitors of the selected systems. Verify that effluent/process monitor configurations align with ODCM descriptions. Look for monitor degradation and out-of-service tags.
- b. Select 5 to 10 portable survey instruments in use or available for issuance. Check calibration and source check stickers for currency, and assess instrument material condition and operability.
- c. Observe licensee staff performance as the staff demonstrates source checks for various types of portable survey instruments. Determine whether high-range instruments are source checked on all appropriate scales. Select at least three different types of portable survey instruments for the source check demonstration.
- d. Walk down five to seven ARMs and continuous air monitors (CAMs) to determine whether they are appropriately positioned relative to the radiation source(s) or area(s) they are intended to monitor. Selectively compare monitor response (via local or remote indication) with actual area conditions for consistency.
- e. Select three to five PCMs, PMs, and SAMs. Verify that the periodic source checks are performed in accordance with the manufacturer's recommendations and licensee procedures.

#### 02.03 Calibration and Testing Program.

- a. Process and Effluent Monitors
  - 1. Select three to five effluent monitor instruments (at least one of each type, such as gaseous, liquid, etc.). Verify that channel calibration and functional tests are performed consistent with radiological effluent technical specifications (RETS)/ODCM. Verify that (a) the licensee calibrates its monitors with National Institute of Standards and Technology (NIST) traceable sources, (b) if a primary calibration, it adequately represents the plant nuclide mix, (c) if a secondary calibration, it verifies the primary

calibration, and (d) the channel calibrations encompass the instrument's alarm setpoints. Focus on point of discharge effluent monitors and others, if time permits.

2. Verify that effluent monitor alarm setpoints are established as provided in the ODCM and station procedures.
3. For changes to effluent monitor setpoints, evaluate the basis for changes to ensure that an adequate justification exists.

#### b. Laboratory Instrumentation

1. Select one of each type of laboratory analytical instruments used for radiological analyses (e.g., gross alpha, gross beta, proportional counters, gamma spectroscopy (including germanium-lithium, high purity-intrinsic germanium) and liquid scintillation counters). Verify that daily performance checks and calibration data indicate that the frequency of the calibrations is adequate and there are no indications of degraded instrument performance.
2. As part of the problem identification and resolution review below, verify that appropriate corrective actions are implemented in response to indications of degraded instrument performance.

#### c. Whole Body Counter

1. Review the methods and sources used to perform WBC functional checks before daily use of the instrument. Determine whether check source(s) are appropriate and align with the plant's isotopic mix.
2. Review WBC calibration reports completed since the last inspection to verify that calibration sources were representative of the plant source term and that appropriate calibration phantoms were used. Look for anomalous results or other indications of instrument performance problems.

#### d. Postaccident Monitoring Instrumentation

1. Select at least one of the dry well/containment high-range monitors and review the calibration documentation since the last inspection.
2. Verify that an electronic calibration was completed for all range decades above 10 rem/hour and that at least one decade at or below 10 rem/hour was calibrated using an appropriate radiation source.
3. Determine if the calibration acceptance criteria are reasonable, accounting for the large measuring range and the intended purpose of the instruments.
4. Select two high-range effluent monitors or other effluent/process monitors that are relied on by the licensee in its emergency operating procedures

(EOPs) as a basis for triggering emergency action levels and subsequent emergency classifications, or to make protective action recommendations (PARs) during an accident. Evaluate the calibration and availability of these instruments.

5. Review the licensee's capability to collect high-range, postaccident iodine effluent samples.
  6. As available, observe electronic and radiation calibration of these instruments to verify conformity with the licensee's calibration and test protocols.
- e. PMs, PCMs, and SAMs
1. Select one to two of each type of these instruments used on site, and verify that the alarm setpoint values are reasonable under the circumstances to ensure that licensed material is not released from the site.
  2. Review calibration documentation for each instrument selected in (1) above, and discuss the calibration methods with the licensee to determine consistency with the manufacturer's recommendations.
- f. Portable Survey Instruments, ARMs, Electronic Dosimetry, and Air Samplers/CAMS
1. Review calibration documentation for at least one of each type of instrument (minimum of four instruments total). For portable survey instruments and ARMs, review detector measurement geometry and calibration methods, plus have the licensee demonstrate use of its instrument calibrator (if applicable). Conduct comparison of instrument readings versus an NRC survey instrument if problems are suspected.
  2. As available, select one to four portable survey instruments that did not meet acceptance criteria during calibration or source checks (including at least one portable hand-held survey instrument and one personal monitoring device, such as an electronic alarm dosimeter, breathing-zone air sampler, etc.). Verify that the licensee has taken appropriate corrective action for instruments found significantly out of calibration (greater than 50 percent). Verify that the licensee has evaluated the possible consequences of instrument use since the last successful calibration or source check.
- g. Instrument Calibrator
1. Review as applicable the current output values (tables, spreadsheets, etc.) for the licensee's portable survey and ARM instrument calibrator unit(s). Verify that the licensee periodically measures calibrator output over the range of the instruments used through measurements by ion chamber/electrometer (or equivalent measuring devices).

2. Verify that the measuring devices have been calibrated by a facility using NIST traceable sources and that correction factors for these measuring devices were properly applied by the licensee in its output verification.

h. Calibration and Check Sources

Review the licensee's 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," source term to determine if the calibration sources used are representative of the types and energies of radiation encountered in the plant. If scaling factors are used for calibrations, the 10CFR Part 61 data may be used as a reference to determine if the licensee is properly scaling (e.g., for hard-to-detect radionuclides).

02.04 Problem Identification and Resolution. Verify that problems associated with radiation monitoring instrumentation are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance. In addition to the above, verify the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve radiation monitoring instrumentation.

71124.05-03 INSPECTION GUIDANCE

03.01 Inspection Planning.

- a. The review of occupational radiation safety instrumentation should include the following:
  1. fixed instrumentation including ARMs, criticality monitors, and the WBC
  2. in-plant airborne monitors including CAMs and portable air samplers
  3. portable survey instruments, particularly those used to identify changing radiological conditions (gamma, neutron, and alpha measuring instrumentation) and for diving operations such that actions to prevent an overexposure may be taken
  4. PCMs, PMs, and SAMs
  5. electronic dosimetry (ED)

Note: Focus should be on portable instrumentation used for monitoring transient high gamma and neutron radiological conditions; air monitors associated with work generating airborne radioactivity; ARMs used to monitor conditions associated with in-core instrumentation, containment sump areas, and radwaste resin transfers; and for determining worker external and internal contamination.

The review of instrumentation used for public radiation safety should include the following:

1. liquid and gaseous effluent and process radiation monitors
2. count lab instrumentation used to quantify effluents such as gamma and alpha spectroscopy systems and liquid scintillation counters

Note: Focus should be on the point-of-discharge effluent monitors and process monitors that trigger automatic actuations. However, it is not necessary to repeat NRC inspection activity for effluent/process radiation monitors that are included under the Maintenance Rule program. Discuss with regional engineering inspection staff which effluent/process monitors will be evaluated under the Maintenance Rule.

Postaccident monitoring and containment isolation instrumentation consists of the following:

1. high-range containment/drywell radiation monitors
2. postaccident sampling system (containment/drywell atmosphere, containment sump, and reactor coolant sampling capability)
3. refueling floor high-range area and reactor building exhaust monitors
4. high-range effluent (System Particulate Iodine and Noble Gas (SPING)) monitors and any other effluent or process monitors that are relied on by the licensee in its EOPs, or to issue PARs during an accident

Note: Do not repeat any NRC inspection activity for any radiation monitor instrumentation that is included under the Maintenance Rule program.

- b. and c. No guidance provided.
- d. Guidance on instrument calibrations and source checks is provided in American National Standards Institute (ANSI) N323A-1997 and ANSI N323D-2002, "American National Standard for Installed Radiation Protection Instrumentation," for portable and fixed radiation monitoring instruments, respectively. Guidance for laboratory instrumentation used for onsite isotopic and effluent analyses (e.g., gamma spectroscopy equipment) is contained in ANSI N42.14-1991, "Calibration and Use of Germanium Spectrometers for the Measurement of Gamma-Ray Emission Rates of Radionuclides."

### 03.02 Walkdowns and Observations.

- a. For effluent sampling systems (e.g., SPINGs), look for indications of nonrepresentative sampling such as severe bends in sample line tubing,

nonisokinetic sampling, or lack of heat tracing in areas where temperature extremes could have an impact (causing condensation and plate-out). Guidance on sampling systems is contained in ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," and ANSI N13.10-1974/ANSI N42.18-2004, "Specification and Performance of Onsite Instrumentation for Continuously Monitoring Radioactivity in Effluents."

- b. For instruments and equipment used for radiological controls for diving, evaluate the adequacy of the licensee's calibration of the underwater radiation monitoring instruments and equipment to ensure adequate detection and measurement of dose (e.g., shifts in gamma energy levels, neutron exposure).
- c. ANSI 323-1978, "Radiation Protection Instrumentation Test and Calibration," and ANSI 323A-1997, "Radiation Protection Instrumentation, Test and Calibration, Portable Survey Instruments," provide additional guidance on instrument source checks.
- d. No guidance provided.
- e. Verification of instrument operability should be done by inspector observation of licensee source checks. If no opportunity for observation is available, verification can be made by reviewing the source check documentation.

#### 03.03 Calibration and Testing Program.

- a. 1. Risk-informed insights should be a key factor in the selection of which instruments are examined by the inspector. For example, instruments used in areas of high dose rates should be of higher priority than personal friskers. Teledose, remote alarming ARMs, and survey and dose alarm devices used for diving activities should be high-priority items for inspection. If electronic alarm dosimeters are used to satisfy a technical specification requirement for a high radiation area, then these devices should be examined periodically.

Guidance on calibration program requirements is in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste"; Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment"; ANSI Standard N13.10-1974, "Sampling Airborne Radioactive Materials in Nuclear Facilities"; and Health Physics Positions (HPPOS) 040 and 229 in NUREG/CR-5569, Revision 1, "Health Physics Positions Data Base," dated May 1, 1992. If an instrument is not calibrated correctly, determine generic applicability and actual and potential exposure impact, and assess the impact with respect to control or emergency preparedness. Verify that the deficiency was entered into the licensee's corrective action program.

If an instrument is not operable, determine what backup instrumentation or other exposure control barriers exist (e.g., teledosimetry used with electronic pocket

dosimeter or radiation protection technician with survey instrument providing additional coverage). If no backup and no other exposure control barriers exist, determine how long the condition has existed, and identify the exposure consequence. Verify that the deficiency was entered into the licensee's corrective action program, and evaluate the corrective actions taken.

2. and 3. Determine if the setpoints are based on an appropriate effluent radionuclide (noble gas) mix so as not to exceed the effluent dose limits in 10 CFR Part 20 and the design constraints in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." The radionuclide mix used in the calculation should be the same as or more conservative (lower average energy) than the licensee's actual source term mix.

- b. Guidance on periodic efficiency calibrations for a spectroscopy system is provided in ANSI N42.14-1991, "American National Standard for Calibration and Use of Germanium Spectrometers for the Measurement of Gamma-Ray Emission Rates of Radionuclides."
- c. No guidance provided.
- d. Refer to the licensee's FSAR, technical specification requirements, and NUREG-0737, "Clarification of TMI Action Plan Requirements," issued November 1980, for guidance on postaccident monitoring instrumentation.

Note: Since these monitors may be used for PARs, ensure that the regional EP staff is aware of any monitoring issues that could impact the monitors' function.

- e. Guidance on the minimum sensitivity and alarm setpoints for PCMs, SAMs, and PMs is provided in Office of Inspection and Enforcement Circular 81-07, "Control of Radioactively Contaminated Material," dated May 14, 1981, and Information Notice 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities," dated December 2, 1985. The alarm setpoints should also align with more restrictive industry standards to ensure that significant variability does not exist between sites.
- f. Through h. No guidance provided

03.04 Problem Identification and Resolution. No guidance provided.

71124.05-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 40 hours, on average (with a range of 36 to 44 hours) to perform the requirements of this attachment.

71124.05-05      COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

DRAFT

Revision History for  
IP 71124.05

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810406

## ATTACHMENT 71124.06

INSPECTION AREA: Radioactive Gaseous and Liquid Effluent Treatment

CORNERSTONE: Public Radiation Safety

EFFECTIVE DATE: January 1, 2010

INSPECTION BASES: Licensees provide adequate protection of the public from effluent releases resulting from normal operations of the plant by maintaining the dose to the maximally exposed member of the public as far below the dose limits in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiations," and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," as low as is reasonably achievable (ALARA). Criterion 60, "Control of Releases of Radioactive Materials to the Environment," in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," requires the control and appropriate mitigation of radioactive materials released as plant effluents. In addition, 10 CFR 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents—Nuclear Power Reactors" (and the associated 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," to 10 CFR Part 50) provide dose-based design criteria to ensure the effectiveness of plant effluent processing systems in maintaining effluent releases to the plant environs ALARA. This inspection area verifies aspects of the Public Radiation Safety Cornerstone not fully measured by performance indicators (PIs). In that cornerstone, the effluent release occurrence PI measures radioactive gaseous and liquid releases that were above a fraction of the technical specification and/or offsite dose calculation manual (ODCM) limits. Unidentified changes to the parameters assumed in the effluent dose calculations (e.g., process system efficiency, release points, exposure pathways) may not be reflected in the PI reporting.

ENCLOSURE 8

Radioactive effluent treatment systems and monitors are required by Criteria 60 and 64, "Monitoring Radioactivity Releases," of Appendix A to 10 CFR Part 50. Proper operation of the system and monitors, as described in the licensee's Radioactive Effluent Controls Program, will ensure an adequate "defense in depth" against an unmonitored, unanticipated, and unplanned discharge of radioactive material to the environment in quantities sufficient to challenge public dose limits.

LEVEL OF EFFORT: Inspect biennially

#### 71124.06-01 INSPECTION OBJECTIVES

01.01 To ensure that the gaseous and liquid effluent processing systems are maintained so that radiological discharges are properly mitigated, monitored, and evaluated with regard to public exposure. Performance requirements are found in General Design Criteria 60 and 64 of Appendix A to 10 CFR Part 50, radiological effluent technical specifications (RETS), and the ODCM.

01.02 To ensure that abnormal radioactive gaseous or liquid discharges and conditions, when effluent radiation monitors are out of service, are controlled in accordance with applicable regulatory requirements and licensee procedures.

01.03 To verify that the licensees' quality control program ensures that the radioactive effluent sampling and analysis requirements are satisfied so that discharges of radioactive materials are adequately quantified and evaluated.

01.04 To verify the adequacy of public dose calculations and projections resulting from radioactive effluent discharges.

#### 71124.06-02 INSPECTION REQUIREMENTS

##### 02.01 Inspection Planning and Program Reviews.

To the extent possible, perform in-office preparation before the inspection, and complete the remaining inspection planning and followup actions during the onsite aspects of the inspection.

##### a. Event Report and Effluent Report Reviews.

1. Review the radiological effluent release report(s) issued since the last inspection. Determine if the reports were submitted as required by the ODCM/technical specifications. Note any anomalous results, unexpected

trends, or abnormal releases identified by the licensee for further inspection to determine if they were evaluated, were entered in the corrective action program, and were adequately resolved.

2. Identify radioactive effluent monitor operability issues reported by the licensee as provided in effluent release reports. Review these issues during the onsite inspection, as warranted, given their relative significance. Determine if the issues were entered into the corrective action program and adequately resolved.

b. ODCM and Final Safety Analysis Report Reviews.

1. Be familiar with final safety analysis report (FSAR) descriptions of the radioactive effluent monitoring systems, treatment systems, and effluent flow paths so they can be verified during inspection walkdowns.
2. Review changes to the ODCM made by the licensee since the last inspection. Review changes against the guidance in the following documents:
  - NUREG-1301, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," issued April 1991
  - NUREG-1302, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors, issued April 1991
  - NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," issued October 1978
  - Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I"
  - Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste"
  - Regulatory Guide 4.1, "Radiological Environmental Monitoring for Nuclear Power Plants"

If differences are identified, review the technical basis or evaluations of the change during the onsite inspection, to determine whether the changes were technically justified and maintain effluent releases ALARA.

3. Determine if the licensee has identified any nonradioactive systems that have become contaminated as disclosed either through an event report or through documentation in the ODCM since the last inspection. Review during the onsite inspection any evaluations performed under 10 CFR 50.59, "Changes, Tests, and Experiments," for systems that have been identified as contaminated since the last inspection. Determine if any of the newly contaminated systems have an unmonitored effluent discharge path to the

environment, whether any required O DCM revisions were made to incorporate these new pathways, and whether the associated effluents were reported in accordance with Regulatory Guide 1.21.

c. Ground Water Protection Initiative Program.

Review reported ground water monitoring results and changes to the licensee's written program for identifying and controlling contaminated spills and leaks to ground water.

d. Procedures, Special Reports, and Other Documents.

1. Review licensee event reports, and/or special reports related to the effluent program issued since the previous inspection. Identify any additional focus areas for the inspection based on the scope or breadth of problems described in these reports.
2. Review effluent program implementing procedures, particularly those associated with effluent sampling, effluent monitor setpoint determinations, and dose calculations.
3. Obtain copies of licensee and third-party (independent) evaluation reports of the effluent monitoring programs since the last inspection. Review the reports for insights into the licensee's program and to aid the inspector in selecting areas for review ("smart sampling").

02.02 Walkdowns and Observations.

- a. Walk down selected components of the gaseous and liquid discharge systems to verify that equipment configuration and flow paths align with the documents reviewed in 02.01 above and to assess equipment material condition. Be alert for potential unmonitored release points (such as open roof vents in boiling-water reactor (BWR) turbine decks, temporary structures butted against turbine, auxiliary, or containment buildings), building alterations that could impact airborne or liquid effluent controls, and ventilation system leakage that communicates directly with the environment.
- b. For equipment or areas associated with the systems selected above that are not readily accessible because of radiological conditions, review the licensee's material condition surveillance records, if applicable.
- c. Walk down those filtered ventilation systems for which the test results will be reviewed later during the inspection. Verify that there are no conditions, such as degraded high-efficiency particulate air (HEPA)/charcoal banks, improper alignment, or system installation issues, that would impact the performance, or the effluent monitoring capability, of the effluent system.

- d. When possible for gaseous waste processing, observe selected portions of the routine processing and discharge of radioactive gaseous effluent (including sample collection and analysis). Verify that appropriate treatment equipment is used and the processing activities align with discharge permits.
- e. Determine if the licensee has made significant changes to its effluent release points (e.g., changes subject to a 10 CFR 50.59 review or that require NRC approval of alternate discharge points, such as burning contaminated oil in an auxiliary boiler).
- f. When possible for liquid waste processing, observe the routine processing and discharge of effluents (including sample collection and analysis). Verify that appropriate effluent treatment equipment is being used and that radioactive liquid waste is being processed and discharged in accordance with procedure requirements and in accordance with discharge permits.

Note: For items 02.02a and 02.02b above, do not duplicate the inspection effort of Inspection Procedure (IP) 71124.08, Section 02.03.

02.03 Sampling and Analyses.

- a. As available, select three to five effluent sampling activities, consistent with smart sampling, and verify that adequate controls have been implemented to ensure that representative samples are obtained (e.g., provisions for sample line flushing, vessel recirculation, composite samplers).
- b. As available, select one to three effluent discharges made with inoperable (declared out-of-service) effluent radiation monitors. Verify that controls are in place to ensure that compensatory sampling is performed consistent with the RETS/ODCM and that those controls are adequate to prevent the release of unmonitored liquid and gaseous effluents.
- c. Determine whether the facility is routinely relying on the use of compensatory sampling in lieu of adequate system maintenance, based on the frequency of compensatory sampling since the last inspection.
- d. Review the results of the interlaboratory comparison program to verify the quality of the radioactive effluent sample analyses. Verify that the interlaboratory comparison program includes hard-to-detect isotopes as appropriate.

02.04 Instrumentation and Equipment. Process monitors, effluent monitors, and count lab instrumentation are reviewed as part of the evaluation of the licensee's Radiation Monitoring Instrumentation Program, as provided in IP 71124.05.

a. Effluent Flow Measuring Instruments.

Review the methodology the licensee uses to determine the effluent stack and vent flow rates. Verify that the flow rates are consistent with RETS/ODCM or FSAR

values and that differences between assumed and actual stack and vent flow rates do not affect the results of the projected public doses.

b. Air Cleaning Systems.

Verify that surveillance test results since the previous inspection for ventilation effluent discharge systems (HEPA and charcoal filtration) required by the technical specifications, such as the standby gas treatment system (in BWRs) and the containment/auxiliary building ventilation system (in pressurized-water reactors (PWRs)), meet technical specification acceptance criteria.

02.05 Dose Calculations.

- a. For significant changes in reported dose values compared to the previous radiological effluent release report (e.g., a factor of 5, or increases that approach the criteria in Appendix I to 10 CFR Part 50), evaluate the factors that may have resulted in the change. If the change was not explained as being influenced by operational issues (e.g., fuel integrity, extended outage, or major decontamination efforts), independently assess the licensee's offsite dose calculations.
- b. Review one to three radioactive liquid and one to three gaseous waste discharge permits. Verify that the projected doses to members of the public are accurate and based on representative samples of the discharge path.
- c. Evaluate the methods used to determine the isotopes that are included in the source term to ensure that all applicable radionuclides are included within detectability standards. Review the current analyses made under 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," to ensure that hard-to-detect radionuclides are included in the source term.
- d. Review changes in the licensee's offsite dose calculations since the last inspection. Verify that the changes are consistent with the ODCM and Regulatory Guide 1.109. Review meteorological dispersion and deposition factors used in the ODCM and effluent dose calculations to ensure that appropriate factors are being used for public dose calculations.
- e. Review the latest land use census and verify that changes (e.g., significant increases or decreases to population in the plant environs, changes in critical exposure pathways, the location of the nearest member of the public, or critical receptor) have been factored into the dose calculations.
- f. For the releases reviewed in (b) above, verify that the calculated doses (monthly, quarterly, and annual dose) are within the dose criteria of 10 CFR Part 50, Appendix I, and the technical specification.
- g. Select, as available, one to three records of any abnormal gaseous or liquid tank discharges (e.g., discharges resulting from misaligned valves or valve leak-by).

Ensure that the abnormal discharge was monitored by the discharge point effluent monitor. If discharges were made with inoperable effluent radiation monitors, or if unmonitored leakage occurred, ensure that an evaluation was made of the discharge to satisfy 10 CFR 20.1501, "General," so as to account for the source term and projected doses to the public.

02.06 Ground Water Protection Initiative Implementation. Verify that the licensee is continuing to implement the voluntary Nuclear Energy Institute/industry Ground Water Protection Initiative (GPI). Perform the following since the last inspection:

- a. Review monitoring results of the GPI to determine if the licensee has implemented its program as intended and to identify any anomalous results. For anomalous results or missed samples, determine if the licensee has identified and addressed deficiencies through its corrective action program.
- b. Review identified leakage or spill events and entries made into 10 CFR 50.75(g) records. Review evaluations of leaks or spills, and review the effectiveness of any remediation actions. Review onsite contamination events involving contamination of ground water (Lessons Learned Task Force (LLTF) Recommendation 17). Assess whether the source of the leak or spill was identified and mitigated.

Note: Limited, defined documentation of the review of abnormal or unplanned radioactive discharges (e.g., leaks and spills) should be provided in the inspection reports (see also Inspection Manual Chapter 0612, "Power Reactor Inspection Reports"). This is LLTF Recommendation 19.

- c. For unmonitored spills, leaks, or unexpected liquid or gaseous discharges, ensure that an evaluation was performed to determine the type and amount of radioactive material that was discharged.
  1. Assess whether sufficient radiological surveys were performed to evaluate the extent of the contamination and the radiological source term. Verify that a survey/evaluation has been performed to include consideration of hard-to-detect radionuclides. Note that scaling factors can be used in bounding calculations.
  2. Determine whether the licensee completed offsite notifications (State, local, and if appropriate, the NRC), as provided in its GPI implementing procedures.
- d. Review the evaluation of discharges from onsite surface water bodies (ponds, retention basins, lakes) that contain or potentially contain radioactivity, and the potential for ground water leakage from these onsite surface water bodies. Determine if licensees are properly accounting for discharges from these surface water bodies as part of their effluent release reports.

- e. Verify that onsite ground water sample results and a description of any significant onsite leaks or spills into ground water for each calendar year are documented in the annual radiological environmental operating report for the radiological environmental monitoring program or the annual radiological effluent release report for the RETS.
- f. For significant, new effluent discharge points (such as significant or continuing leakage to ground water that continues to impact the environment if not remediated), determine if the ODCM was updated to include the new release point.

02.07 Problem Identification and Resolution. Verify that problems associated with the effluent monitoring and control program are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee's corrective action program. See IP 71152, "Identification and Resolution of Problems," for additional guidance. (optional) In addition to the above, verify the appropriateness of the corrective actions for the selected sample of problems documented by the licensee that involve radiation monitoring and exposure controls.

## 71124.06-03 INSPECTION GUIDANCE

### 03.01 Inspection Planning.

- a. Ensure that docketed reports since the previous inspection are included in the current inspection (e.g., annual radioactive effluent release reports, special 30-day reports, supplemental monitoring reports, ODCM revisions). Consider scheduling this inspection soon after the annual radiological environmental report has been submitted, so that recent data can be compared between the effluent report and the environmental reports.
- b. Guidance on new release points is in LLTF Recommendation 17.

Note: In accordance with Regulatory Guide 1.109, a significant new exposure pathway exists if a conservative evaluation yields an additional dose increment equal to or more than 10 percent of the total from all exposure pathways considered in Regulatory Guide 1.109.

- c. Files required by 10 CFR 50.75g (or corrective action program files referencing 10 CFR 50.75g files) should contain a description of the leak or spill (isotopes and quantities), location and size of the impacted area, cross-reference to survey results, and results of any remediation performed. If undetected leakage has occurred or is suspected and insufficient monitoring/remediation actions have been taken by the licensee, discuss this issue with your supervisor. If you need assistance in assessing the adequacy of the licensee's onsite or offsite monitoring activities and/or the site's hydrologic characteristics are not clearly defined, consult the program office.

- d. No guidance provided.

#### 03.02 Walkdowns and Observations.

- a. During facility tours, be sensitive to potential unmonitored radioactive gaseous and liquid effluent points. Evaluate how the licensee is quantifying gaseous and liquid discharges and is calculating the associated doses. Review the licensee's assessment of the source term used, including all radionuclides discharged, within detectability standards. Be aware of system contamination that may have impacted otherwise noncontaminated systems (e.g., PWR turbine sumps, plant boilers, residual heat removal heat exchangers).
- b. Office of Inspection and Enforcement Bulletin 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release to Environment," dated May 6, 1980, provides guidance on contaminated systems not originally designed to be contaminated.
- c. Guidance on the performance of ventilation charcoal and filter banks is provided in American Society for Mechanical Engineers (ASME) N510-1989, "Testing of Nuclear Air-Treatment Systems."
- d. In general, discharge points that are secondary dispersion/dilution points (i.e., those originating from authorized effluent discharges such as rain-out into storm drains or drainage from equipment condensation, including freezers) do not need further evaluation (see Regulatory Issue Summary 2008-03, "Return/Re-use of Previously Discharged Radioactive Effluents," February 13, 1980). However, the discharge of radioactive material from unusual discharge points (e.g., pumping of water from cable trays) needs an evaluation before discharge. This evaluation can be a bounding evaluation for less significant release points (see Regulatory Guide 1.21, Revision 2).

#### 03.03 Sampling and Analyses.

- a. Evaluate potential sampling system configurations or situations that may impact representative sampling (e.g., media bypass, humidity, line loss, heat trace).
- b. No guidance provided.
- c. No guidance provided.
- d. Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)," Regulatory Guide 1.21, and Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment," provide the regulatory basis for the licensee's participation in an interlaboratory comparison program to verify the quality of radioactive effluent sample analyses.

03.04 Instrumentation and Equipment.

- a. Guidance on the maintenance of flow measurement devices (e.g., pitot tubes) and filter testing is contained in American National Standards Institute (ANSI) N42.18-2004, "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents."

If available, review historical trends in inlet/vent/stack flow rates to determine if substantial variability exists, which potentially indicates flow restrictions in the measuring device or fan motor problems.

- b. Guidance on performance testing of ventilation systems required by technical specification is provided in ASME N510-1989.

Coordinate with the resident inspectors before inspecting safety-related (accident scenario) ventilation systems to avoid duplication of effort.

03.05 Dose Calculations.

- a. Use either the NRC PC-DOSE computer code (agreement should be within a factor of 2), perform manual calculation, or review the licensee's dose calculation methods.
- b. through g. No guidance provided.

03.06 Ground Water Protection Initiative Implementation.

- a. through d. No guidance provided.

03.07 Problem Identification and Resolution. No guidance provided.

71124.06-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 30 hours, on average (with a range of 26 to 34 hours) to perform the requirements of this attachment.

71124.06-5 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP 71124.06

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810414

## ATTACHMENT 71124.07

INSPECTION AREA: Radiological Environmental Monitoring Program

CORNERSTONE: Public Radiation Safety

EFFECTIVE DATE: January 1, 2010

INSPECTION BASES: The radiological environmental monitoring program (REMP) is required by Criterion 64, "Monitoring Radioactivity Releases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." The REMP supplements the effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation in the environment are in agreement with the values predicted by the radioactive effluent monitoring program. The licensee is required to implement the REMP in accordance with its technical specifications (TS) and/or offsite dose calculation manual (ODCM), which are based on the design objectives contained in 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," to 10 CFR Part 50, as required by 10 CFR 50.34a, "Design Objectives for Equipment To Control Releases of Radioactive Material in Effluents—Nuclear Power Reactors." The scope of the REMP is specified in 10 CFR Part 50, Appendix I, Section IV, paragraph B. This inspection area verifies aspects of the Public Radiation Safety Cornerstone for which there are no performance indicators to measure performance.

LEVEL OF EFFORT: Inspect biennially

ENCLOSURE 9

## 71124.07-01 INSPECTION OBJECTIVES

01.01 To verify that the REMP quantifies the impact of radioactive effluent releases to the environment and sufficiently validates the integrity of the radioactive gaseous and liquid effluent release program.

01.02 To verify that the REMP is implemented consistently with the licensee's TS and/or ODCM and to validate that the radioactive effluent release program meets the design objective in Appendix I to 10 CFR Part 50.

01.03 To ensure that the REMP (1) monitors noneffluent exposure pathways (e.g., onsite spills or leaks, exposures from direct and scattered (skyshine) radiation from plant facilities and components), (2) is based on sound principles and assumptions, and (3) validates that doses to members of the public are within the dose limits of 10 CFR Part 20, "Standards for Protection against Radiation," and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," as applicable.

## 71124.07-02 INSPECTION REQUIREMENTS

### 02.01 Inspection Planning.

- a. Review the annual radiological environmental operating reports, and the results of any licensee assessments since the last inspection, to verify that the REMP was implemented in accordance with the TS and ODCM. Review the report for changes to the ODCM with respect to environmental monitoring, commitments in terms of sampling locations, monitoring and measurement frequencies, land use census, interlaboratory comparison program, and analysis of data.
- b. Review the ODCM to identify locations of environmental monitoring stations.
- c. Review the final safety analysis report (FSAR) for information regarding the environmental monitoring program and meteorological monitoring instrumentation.
- d. Review quality assurance audit results of the program to assist in choosing inspection "smart samples." If the licensee uses a vendor laboratory to analyze the REMP samples, review any audits and technical evaluations performed on the vendor's program.
- e. Review the annual effluent release report and the 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," report, to determine if the licensee is sampling, as appropriate, for the predominant and dose-causing radionuclides likely to be released in effluents.

## 02.02 Site Inspection.

- a. Walk down three to five of the air sampling stations and three to five of the thermoluminescent dosimeter (TLD) monitoring stations to determine whether they are located as described in the ODCM and to determine the equipment material condition. Consistent with smart sampling, the air sampling stations should be selected based on the locations with the highest X/Q, D/Q wind sectors, and TLDs should be selected based on the most risk-significant locations (e.g., those that have the highest potential for public dose impact).
- b. For the air samplers and TLDs selected above, review the calibration and maintenance records to verify that they demonstrate adequate operability of these components. Additionally, review the calibration and maintenance records of up to five composite water samplers as available.
- c. Verify that the licensee has initiated sampling of other appropriate media upon loss of a required sampling station.
- d. Observe the collection and preparation of two to four environmental samples from different environmental media (e.g., ground and surface water, milk, vegetation, sediment, and soil) as available. Verify that environmental sampling is representative of the release pathways as specified in the ODCM and that sampling techniques are in accordance with procedures.
- e. Based on direct observation and review of records, verify that the meteorological instruments are operable, calibrated, and maintained in accordance with guidance contained in the FSAR, NRC Regulatory Guide 1.23, "Meteorological Monitoring Programs for Nuclear Power Plants," and licensee procedures. Verify that the meteorological data readout and recording instruments in the control room and, if applicable, at the tower are operable.
- f. Verify that missed and or anomalous environmental samples are identified and reported in the annual environmental monitoring report. As available, select three to five events that involved a missed sample, inoperable sampler, lost TLD, or anomalous measurement, and verify that the licensee has identified the cause and has implemented corrective actions. Review the licensee's assessment of any positive sample results (i.e., licensed radioactive material detected above the lower limits of detection (LLDs)). Review the associated radioactive effluent release data that was the source of the released material.
- g. Select three to five structures, systems, or components (SSCs) that involve or could reasonably involve licensed material for which there is a credible mechanism for licensed material to reach ground water, and verify that the licensee has implemented a sampling and monitoring program sufficient to detect leakage of these SSCs to ground water.

- h. Verify that records, as required by 10 CFR 50.75(g), of leaks, spills, and remediation since the previous inspection are retained in a retrievable manner.
- i. Review any significant changes made by the licensee to the ODCM as the result of changes to the land census, long-term meteorological conditions (3-year average), or modifications to the sampler stations since the last inspection. Review technical justifications for any changed sampling locations. Verify that the licensee performed the reviews required to ensure that the changes did not affect its ability to monitor the impacts of radioactive effluent releases on the environment.
- j. Verify that the appropriate detection sensitivities with respect to TS/ODCM are used for counting samples (i.e., the samples meet the TS/ODCM required LLDs). Review quality control charts for maintaining radiation measurement instrument status and actions taken for degrading detector performance. If the licensee uses a vendor laboratory to analyze the REMP samples, review the results of the vendor's quality control program, including the interlaboratory comparison program, to verify the adequacy of the vendor's program.
- k. Review the results of the licensee's interlaboratory comparison program to verify the adequacy of environmental sample analyses performed by the licensee. Verify that the interlaboratory comparison test included the media/nuclide mix appropriate for the facility. If applicable, review the licensee's determination of any bias to the data and the overall effect on the REMP.

02.03 Identification and Resolution of Problems. Verify that problems associated with the REMP are being identified by the licensee at an appropriate threshold and are properly addressed for resolution in the licensee's corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance (optional). In addition to the above, verify the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve the REMP.

## 71124.07-03 INSPECTION GUIDANCE

### 03.01 Inspection Planning.

- a. Guidance on the proper location of environmental monitoring stations is in NUREG-1301, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," issued April 1991. Also, refer to the NRC Branch Technical Position, Revision 1, "An Acceptable Radiological Environmental Monitoring Program," for additional information.
- b. through e. No guidance provided.

### 03.02 Site Inspection.

- a. Shifts in wind sectors with the highest X/Q and D/Q may be detected by comparing several years of the licensee's meteorological data.
- b. No guidance provided.
- c. Guidance on sample collection and preservation is provided in NUREG-1576, "Multi-Agency Radiological Laboratory Analytical Protocols Manual" (MARLAP), issued July 2004. Also, refer to the NRC Branch Technical Position, Revision 1, "An Acceptable Radiological Environmental Monitoring Program," for guidance on sampling other appropriate media upon loss of a required sample location.
- d. Compare readout data (i.e., wind speed, wind direction, and delta temperature) in the control room and at the meteorological tower to identify any differences that would indicate that inaccurate data are being used for dose determination.

Note that most 10 CFR Part 50 licensees will not be committed to Regulatory Guide 1.23, but may be committed to Safety Guide 23 (1972).

- e. Ensure that the licensee has addressed any positive indications in the environmental monitoring samples and has adjusted the effluent monitoring program and dose modeling, as appropriate to ensure the accuracy of the models. (See Section 6.8 in NUREG-1301 and in NUREG-1302, "Offsite Dose Calculation Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors," issued April 1991.)
- f. Some examples of SSCs are outdoor refueling water storage tanks, spent fuel pools, spent fuel pool leak detection systems, outdoor tanks, outdoor storage of contaminated equipment, buried piping, retention ponds, basins, or reservoirs, and steam lines. Some examples of leak detection methods for the SSCs are ground water monitoring, operator rounds, engineering walkdowns or inspections, leak detection systems, or periodic integrity testing.
- g. through i. No guidance provided.

### 03.03 Identification and Resolution of Problems. No guidance provided.

#### 71124.07-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 26 hours, on average (with a range of 22 to 30 hours) to perform the requirements of this attachment.

71124.07-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

DRAFT

Revision History for  
IP 71124.07

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810423

## ATTACHMENT 71124.08

INSPECTION AREA: Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation

CORNERSTONE: Public Radiation Safety 80%  
Occupational Radiation Safety 20%

EFFECTIVE DATE: January 1, 2010

INSPECTION BASES: The regulatory requirements in Criterion 60, "Control of Releases of Radioactive Materials to the Environment," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and the requirements of 10 CFR Parts 20, 61, and 71 and U.S. Department of Transportation regulations in 49 CFR Parts 170 through 189, ensure adequate protection for members of the public from the processing, handling, storage, and transportation of radioactive materials. This inspection area verifies aspects of the Public Radiation Safety Cornerstone for which there are no performance indicators for unplanned public exposure during transportation of radioactive material.

LEVEL OF EFFORT: Inspect Biennially

### 71124.08-01 INSPECTION OBJECTIVES

01.01 To verify the effectiveness of the licensee's programs for processing, handling, storage, and transportation of radioactive material.

### 71124.08-02 INSPECTION REQUIREMENTS

02.01 Inspection Planning. Whenever possible, coordinate the inspection schedule with the licensee to coincide with risk-significant activities so that licensee performance can be directly observed.

ENCLOSURE 10

- a. Review the solid radioactive waste system description in the final safety analysis report (FSAR), the Process Control Program (PCP), and the recent radiologic effluent release report for information on the types, amounts, and processing of radioactive waste disposed.
- b. Review the scope of any quality assurance (QA) audit in this area since the last inspection to gain insights into the licensee's performance and inform the "smart sampling" inspection planning.

#### 02.02 Radioactive Material Storage.

- a. Select one to three areas where containers of radioactive waste are stored, and verify that the containers are labeled in accordance with 10CFR 20.1904, "Labeling Containers," or controlled in accordance with 10 CFR 20.1905, "Exemptions to Labeling Requirements," as appropriate. Do not duplicate inspection effort performed under Inspection Procedure 71124.01.
- b. Verify that the radioactive materials storage areas are controlled and posted in accordance with the requirements of 10 CFR Part 20, "Standards for Protection against Radiation." For materials stored or used in the controlled or unrestricted areas, verify that they are secured against unauthorized removal and controlled in accordance with 10CFR 20.1801, "Security of Stored Material," and 20CFR 1802, "Control of Material Not in Storage," as appropriate.
- c. Verify that the licensee has established a process for monitoring the impact of long-term storage (e.g., buildup of any gases produced by waste decomposition, chemical reactions, container deformation, loss of container integrity, or re-release of free-flowing water) sufficient to identify potential unmonitored, unplanned releases or nonconformance with waste disposal requirements.
- d. Select 5 to 10 containers of stored radioactive materials, and verify that there are no signs of swelling, leakage, and deformation.

NOTE: The inspector should exercise caution in that some of these containers may exhibit elevated dose rates and some containers may not be accessible. Container conditions can be verified by review of licensee programs or by direct observation, consistent with as low as reasonably achievable (ALARA) principles.

#### 02.03 Radioactive Waste System Walkdown.

- a. Select one to three liquid or solid radioactive waste processing systems. Walk down accessible portions of systems to verify and assess that the current system configuration and operation agree with the descriptions in the FSAR, offsite dose calculation manual, and PCP.
- b. Select radioactive waste processing equipment that is not operational and/or is abandoned in place, and verify that the licensee has established administrative

and/or physical controls (i.e., drainage and isolation of the system from other systems) to ensure that the equipment will not contribute to an unmonitored release path and/or affect operating systems or be a source of unnecessary personnel exposure. Verify that the licensee has reviewed the safety significance of systems and equipment abandoned in place in accordance with 10 CFR 50.59, "Changes, Tests, and Experiments."

- c. Review the adequacy of any changes made to the radioactive waste processing systems since the last inspection. Verify that changes from what is described in the FSAR were reviewed and documented in accordance with 10 CFR 50.59, as appropriate. Review the impact, if any, on radiation doses to members of the public.
- d. Select one to three processes for transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers. Verify (for the selected processes) that the waste stream mixing, sampling procedures, and methodology for waste concentration averaging are consistent with the PCP, and provide representative samples of the waste product for the purposes of waste classification as described in 10 CFR 61.55, "Waste Classification."
- e. For those systems that provide tank recirculation, verify that the tank recirculation procedure provides sufficient mixing (generally a minimum of three volumes is provided).
- f. Verify that the licensee's PCP correctly describes the current methods and procedures for dewatering and waste stabilization (e.g., removal of freestanding liquid).

#### 02.04 Waste Characterization and Classification.

- a. Select two to three radioactive waste streams (e.g., dry active waste, ion exchange resins, mechanical filters, sludges, and activated materials), and verify that the licensee's radiochemical sample analysis results (i.e., "10 CFR Part 61" analysis) are sufficient to support radioactive waste characterization as required by 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." Verify that the licensee's use of scaling factors and calculations to account for difficult-to-measure radionuclides is technically sound and based on current 10 CFR Part 61 analysis.
- b. For the waste streams selected above, verify that changes to plant operational parameters are taken into account to (1) maintain the validity of the waste stream composition data between the annual or biennial sample analysis update, and (2) verify that waste shipments continue to meet the requirements of 10 CFR Part 61. For example, the shipping staff may monitor reactor coolant radiochemistry to ensure the stability of the waste stream analyses. Changes in reactor coolant chemistry (e.g., fuel integrity or corrosion film morphology) can result in changes to the waste stream compositions.

- c. Verify that the licensee has established and maintains an adequate QA program to ensure compliance with the waste classification and characterization requirements of 10 CFR 61.55 and 10 CFR 61.56, "Waste Characteristics."

#### 02.05 Shipment Preparation.

- a. Observe shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and licensee verification of shipment readiness. Verify that the requirements of any applicable transport cask certificate of compliance (CoC) have been met. Verify that the receiving licensee is authorized to receive the shipment packages. If applicable, verify that the licensee's procedures for cask loading and closure procedures are consistent with the vendor's current approved procedures.
- b. Observe radiation workers during the conduct of radioactive waste processing and radioactive material shipment preparation and receipt activities. Determine if the shippers are knowledgeable of the shipping regulations and whether shipping personnel demonstrate adequate skills to accomplish the package preparation requirements for public transport with respect to NRC Bulletin 79-19, "Packaging of Low-Level Radioactive Waste for Transport and Burial," dated August 10, 1979, and 49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information, Training Requirements, and Security Plans," Subpart H, "Training." If direct observation is limited, review the technical instructions presented to workers during routine training. Verify that the licensee's training program provides training to personnel responsible for the conduct of radioactive waste processing and radioactive material shipment preparation activities.

02.06 Shipping Records. Select three to five nonexcepted package shipment (LSA I, II, III; SCO I, II; Type A or Type B) records. As a minimum, verify that the shipping documents indicate the proper shipper name; emergency response information and a 24-hour contact telephone number; accurate curie content and volume of material; and appropriate waste classification, transport index, and UN number. Verify that the shipment placarding is consistent with the information in the shipping documentation.

#### 02.07 Identification and Resolution of Problems.

- a. Verify that problems associated with radioactive waste processing, handling, storage, and transportation, are being identified by the licensee at an appropriate threshold, are properly characterized, and are properly addressed for resolution in the licensee corrective action program. See Inspection Procedure 71152, "Identification and Resolution of Problems," for additional guidance. (optional) In addition to the above, verify the appropriateness of the corrective actions for a selected sample of problems documented by the licensee that involve radioactive waste processing, handling, storage, and transportation.

- b. Review results of selected audits performed since the last inspection of this program and evaluate the adequacy of the licensee's corrective actions for issues identified during those audits.

71124.08-03 INSPECTION GUIDANCE

03.01 Inspection Planning.

- a. No guidance provided.
- b. No guidance provided.
- c. No guidance provided.

03.02 Radioactive Material Storage.

- a. No guidance provided.
- b. No guidance provided.
- c. See Information Notice 90-50, "Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers," dated August 8, 1990.
- d. No guidance provided.

03.03 Radioactive Waste System Walkdown.

- a. No guidance provided.
- c. No guidance provided.
- d. See NRC, "Revised Staff Technical Position on Waste Form (SP-91-13)," dated January 30, 1991, and NRC, "Final Waste Classification and Waste Form Technical Position Papers," dated May 11, 1983.
- e. See NRC, "Issuance of Final Branch Technical Position on Concentration Averaging and Encapsulation," dated January 17, 1995.
- f. No guidance provided.

03.04 Waste Characterization and Classification.

- a. Guidance on meeting the requirements of 10 CFR 61.55 and 10 CFR 61.56, as well as Appendix G, "Control of Exposure From External Sources in Restricted Areas," to 10 CFR Part 20 is provided in the Branch Technical Position, "Waste Form

Technical Position”; IE Information Notice 86-20, “Low-Level Radioactive Waste Scaling Factors, 10 CFR Part 61,” dated March 28, 1986; Technical Position on Concentration Averaging; and NUREG-1608, “Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects,” issued July 1998.

- b. No guidance provided.
- c. No guidance provided.

03.05 Shipment Preparation.

- a. Guidance on shipping preparation is provided in NUREG-1660, “U.S.-Specific Schedules for Transport of Specified Types of Radioactive Material Consignments,” issued January 1990.
- b. No guidance provided.

03.06 Shipping Records. Guidance on the content of shipping records is provided in NUREG-1660. The inspector should focus on those waste stream products that represent the most risk-significant waste shipments.

03.07 Identification and Resolution of Problems. No guidance provided.

71124.08-04 RESOURCE ESTIMATE

For planning purposes, it is estimated to take 34 hours, on average (with a range of 30 to 38 hours), to perform the requirements of this attachment.

71124.08-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the RPS. The minimum sample size for this attachment is one, defined as the sum of all the inspection requirements. Therefore, all the inspection requirements of the procedure should be completed. If some of the requirements cannot be performed because of a lack of samples, the procedure should be closed with comment.

END

Revision History for  
IP 71124.08

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
Conducted four year search for commitments and found none.	10/__/2009	This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.	YES	09/09/2009	ML092810433