

CONSTRUCTION AND PREOPERATIONAL INSPECTION PROGRAM AT URANIUM RECOVERY AND 11e.(2) BYPRODUCT MATERIAL FACILITIES

PROGRAM APPLICABILITY: 2801

89015-01 INSPECTION OBJECTIVES

01.01 To establish the construction and preoperational inspection program requirements for conventional uranium mills, in situ recovery (ISR) uranium mills, 11e.(2) byproduct material disposal sites, and other 11e.(2) byproduct material sites licensed and regulated under Title 10 to the *Code of Federal Regulations* (10 CFR) Part 40.

01.02 To determine if construction and preoperational activities are effectively implemented so that future operations with licensed radioactive material will be protective of workers, members of the public, and the environment.

01.03 To determine if construction and preoperational activities comply with U.S. Nuclear Regulatory Commission (NRC) license and regulatory requirements.

89015-02 INSPECTION REQUIREMENTS

This Inspection Procedure (IP) provides the basic requirements and guidance for inspections of construction and preoperational activities at sites licensed under 10 CFR Part 40. This IP can be used for inspections after an extended shutdown or after completion of major facility modifications. This IP should be used in conjunction with other core and discretionary IPs provided in Inspection Manual Chapter (IMC) 2801, "Uranium Recovery and 11e.(2) Byproduct Material Facility Inspection Program."

02.01 Inspection Requirements to Achieve Inspection Objectives. The emphasis of this inspection effort is to ensure that the licensee has: (1) constructed and preoperationally tested the facility in accordance with license and regulatory requirements; (2) established critical programs and procedures to ensure safe operations in the future; and (3) trained workers to conduct operations in a safe manner. The license and associated application provide the requirements for each licensed site, and the inspection will confirm that the licensee has implemented these license requirements. To meet the objectives of this IP, the inspector shall conduct the following minimum inspection activities:

- a. To the extent possible, the inspector shall prepare for the inspection in the office before the onsite inspection. This effort should include review of the site's performance-based license and license application for construction and operational requirements. The inspector should consider requesting electronic copies of the licensee's manuals or procedures prior to the inspection.

- b. Conduct one or more site tours to verify that critical equipment, facilities, and flow paths have been constructed and are ready for operations.
- c. If possible, observe one or more critical activities, such as resin transfers, equipment operations, or flow testing, that demonstrate that the staff, equipment, and flow paths are functionally ready for operations with licensed material.
- d. Verify through a records review that the licensee has developed programs for all applicable areas including radiation protection, environmental monitoring, radwaste management, operations, transportation, and emergency responses.
- e. If there have been significant changes in the programs since the last inspection, ensure that these changes have been appropriately evaluated and implemented by the licensee.

Once the NRC has determined that the license-required equipment, facilities, and procedures have been adequately developed and implemented, future inspections will concentrate on changes as well as the licensee's implementation of these programs and procedures. Inspections during the construction and pre-operational phase will be conducted on a case--by--case basis. Pre-operational inspections will be conducted at least once before startup of facility operations.

02.02 Performance-based/Risk-informed Inspections. In accordance with Commission policy (SECY-98-144), inspectors must conduct performance-based inspections with an emphasis on risk-significant activities that have an impact on safety and the environment. A performance-based inspection emphasizes the observation of activities and results of the licensees' programs over the review of procedures or records. The risk-informed inspection approach considers risk insights together with other factors to focus inspection activities commensurate with the risks associated with the implementation of the licensee's NRC-approved programs.

The higher risk activities that may impact future operational safety include well installation, wellfield pressure tests, and disposal cell construction. In summary, the inspector shall verify compliance primarily through observations of site conditions, observations of work activities, interviews with workers, demonstrations by workers, and reviews of critical records. The inspector shall focus attention on the most important, risk-significant activities and the results of the licensee's efforts.

The goal of the construction and preoperational inspection program is to ensure that the licensee has established the equipment, facilities, and procedures required by 10 CFR 40.32(c). Thus, some portions of the inspection program will be compliance-based. The compliance-based portion of the inspection ensures that licensees have established the programs and procedures that will be protective of health and safety during future operations with licensed material.

89015-03 INSPECTION GUIDANCE

03.01 Regulatory Requirements. 10 CFR 40.32(c) states, in part, that an application for a specific license will be approved if the applicant's proposed equipment, facilities, and procedures are adequate to protect health and minimize danger to life or property. The NRC

conducts construction and preoperational inspections to verify that the licensee has constructed a facility and established support programs as described in the application and the license.

10 CFR Part 40, Appendix A, Criterion 7, provides the preoperational, construction, and operational monitoring program requirements. Additional information about acceptable preoperational monitoring programs is provided in Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills." The construction and/or preoperational inspection will verify if the licensee has established and implemented these monitoring programs.

03.02 Differences Between Preconstruction, Construction, and Operation. Regulations provide some differentiation between preconstruction, construction, and operational activities. Regulation 10 CFR 40.4 defines the term "construction" and provides a list of activities that are not related to construction. An applicant may commence with preconstruction activities prior to issuance of a license. Similarly, an existing site may expand operations into new areas that are not currently licensed, and the licensee may conduct these preconstruction activities without prior NRC approval. Appendix A provides a checklist of preconstruction activities that can be accomplished at a site without a license.

Construction activities typically commence after the license has been issued. As defined in 10 CFR 40.4, construction means the installation of wells associated with radiological operations (e.g., production, injection, or monitoring well networks associated with ISR or other facilities), the installation of foundations, or in-place assembly, erection, fabrication, or testing for any structure, system, or component of a facility or activity subject to the regulations in this part that are related to radiological safety or security. The NRC should conduct inspections during critical construction activities to ensure that the licensee is adhering to the design requirements specified in the application and license. Appendix B provides a checklist of activities that may be present during construction-related inspections.

Preoperational inspections are typically conducted at the end of the construction phase but prior to operations. The term "operation" is defined in Appendix A to 10 CFR Part 40. Operation means that a uranium or thorium mill tailings pile or impoundment is being used for the continued placement of byproduct material or is in standby status for such placement. A pile or impoundment is in operation from the day that byproduct material is first placed in the pile or impoundment until the day final closure begins. For ISR facilities, the NRC considers the commencement of operations involving lixiviant as the starting point for licensed operations. The purposes of the preoperational inspection are to ensure that the licensee has the staff, programs and procedures, and structures and facilities to commence with licensed operations. Appendix C provides a checklist of activities that may be present during preoperational inspections.

03.03 Detailed Inspection Guidance. This section provides an overview of the inspection program during the preconstruction, construction, and preoperational phases.

Preconstruction site visits are conducted to observe the applicant's proposed site, to observe preconstruction activities in progress, or to support the license application review. These site visits should be coordinated with the NRC's program office. The inspection expertise needed for these site visits may include environmental, construction, or geotechnical experts. Historically, these site visits have been coordinated with other State and Federal agencies and have included inter-agency meetings at or near the sites under review. These site visits are not formal inspections, but the findings of the site visit should be documented in memorandums to

the docket file. During preconstruction site visits, the inspector should confirm that the licensee has not started any construction activities as defined in 10 CFR 40.4.

Construction and preoperational inspections tend to be non-routine, announced inspections that are conducted to observe specific activities in progress. These inspections should be scheduled to coincide with time sensitive activities such as concrete pours, pump tests, well installations, or flow/pressure tests. The inspector should coordinate these inspections with the associated program office project managers. The inspectors and project managers should have geotechnical, hydrogeological, environmental, and health physics experience. Representatives of NRC management should be present during parts of the inspection, as necessary, to reinforce the NRC's expectations regarding future use of licensed material.

The inspector should consider developing an inspection plan to help coordinate the inspection in advance. The inspection plan should state the facility to be inspected; docket number and report number; dates of the inspection; names of inspectors conducting the inspection; responsibilities for review of each program area; what procedures or checklists will be used; and the events, open violations, orders, or any special issues that will be reviewed as part of the inspection. The inspection plan should identify which programs, activities, and areas will be inspected, especially if the facility plans to start up in phases. Since the inspection plan is used to support the inspection, the inspection plan does not have to be added to the docket file.

Prior to the preoperational inspection, the NRC staff should ensure that the licensee is prepared for the inspection; otherwise, the inspector will spend onsite inspection time compiling lists of program areas that need additional attention prior to reinspection. Licensees may be motivated to complete the preoperational inspection as soon as possible, since the licensee wants to start income-producing operations.

More than one preoperational inspection may be necessary. Historically, newly constructed sites have rarely been ready to commence with operations immediately after the first preoperational inspection. Further, some sites have been constructed in phases, and preoperational inspections are needed for each phase of startup. For example, an ISR licensee may start wellfield operations with plans to install and operate a yellowcake dryer at a later date. Subsequent preoperational inspections would concentrate on the programs, equipment, and facilities that were not present during earlier inspections.

Licensees may choose to expand existing operations. For example, an operating ISR facility may expand operations into new mining units. Inspections at these facilities may include construction or preoperational reviews in addition to routine operational reviews.

03.04 License Requirements for Preoperational Inspections. Newer licenses issued in accordance with 10 CFR Part 40 include specific conditions stating that the licensee cannot commence with operations until the NRC has conducted a preoperational inspection. Immediately after completion of the onsite inspection and possibly before the issuance of the associated inspection report, the inspector will coordinate with the program office to determine if the licensee is ready to commence operations. If the NRC staff concludes that the licensee is ready, the inspection staff will develop an authorization letter which gives the licensee permission to begin operational activities. The authorization letters may be conditional, that is, to authorize limited operations until certain activities have been completed. In these situations, future inspections will ensure that these conditions have been fulfilled, allowing the licensee to potentially expand their operations.

Examples of authorization letters can be found in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession Nos. ML14105A422 and ML16033A344.

03.05 Documentation of Inspections. Preconstruction site visits should be documented in memorandums to the docket file. In rare situations, the NRC may choose to send a letter and narrative report to the applicant if the NRC identifies non-compliances or wants to send a message to the applicant's management. Unless the memorandum or letter report includes information that is considered proprietary by the licensee, the memorandum or letter should be made publicly available.

Construction inspections can be documented in memorandums to the docket file or narrative reports, depending on the size and complexity of the inspection team and the depth of the inspection. Preoperational inspections should be documented in narrative inspection reports using the guidance provided in IMC 0610, "Nuclear Material Safety and Safeguards Inspection Reports." Unless the memorandums or inspection reports contain proprietary information, the inspection documentation should be made publicly available.

At the discretion of the inspector and NRC management, the narrative inspection report can be structured in different ways. The traditional documentation style is described in IMC 0610 and includes the executive summary, site status, discussion of each IP, etc. Due to the uniqueness of these inspections, NRC has issued inspection reports that consisted of cover letters, expanded executive summaries, and spreadsheets or matrices of each program area reviewed. See ADAMS Accession Nos. ML14107A507 and ML14134A150 for examples of inspection reports that included expanded executive summaries and matrices.

89015-04 RESOURCE ESTIMATE

Construction and preoperational inspections typically require support from both regional and program office staff. Construction-related inspections typically involve 2-3 NRC staff and take about 2-3 days, or approximately 32-72 hours, to complete. This resource estimate excludes travel, preparation, and documentation time. Preoperational inspections typically involve 3-4 NRC staff and take about 4-5 days, or 96-160 hours, to complete. After the first team inspection, subsequent preoperational inspections typically take less time and less staff to complete since inspectors only need to review certain program areas. Subsequent preoperational inspections may be combined with operational inspections.

89015-05 PROCEDURE COMPLETION

The construction portion of this IP is complete when the NRC staff observes the activities that were planned to be observed or reviewed and/or when construction has been completed. The preoperational phase of this IP is considered complete when the NRC issues the associated authorization to operate letter. However, a site is commonly constructed in phases, so each phase is reviewed and inspected during each stage of construction and preoperational work. This IP is no longer necessary when a site has completed all construction and preoperational-related activities.

89015-06 REFERENCES

Inspection Manual Chapter 0610, "Nuclear Material Safety and Safeguards Inspection Reports,"
May 18, 2004

Inspection Manual Chapter 2801, Uranium Recovery and 11e.(2) Byproduct Material Facility
Inspection Program," October 8, 2021

Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills,"
dated April 1980

Staff Requirements SECY-98-144, "White Paper on Risk-informed and Performance-based
Regulation," March 1, 1999

END

Appendix A: Checklist for Preconstruction Reviews
Appendix B: Checklist for Construction Inspections
Appendix C: Checklist for Preoperational Inspections

Attachment 1: Revision History for IP 89015

CHECKLIST FOR PRECONSTRUCTION REVIEWS

This appendix provides lists of proposed topics that should be considered during inspections of preconstruction activities. In accordance with 10 CFR 40.4, the following preconstruction activities can be implemented by an applicant or licensee without prior NRC approval:

- Changes for temporary use of the land for public recreational purposes
- Site exploration, including necessary borings to determine foundation conditions or other preconstruction monitoring to establish background information related to the suitability of the site, the environmental impacts of construction or operation or the protection of environmental values
- Preparation of the site for construction of the facility, including clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas
- Erection of fences and other access control measures that are not related to the safe use of, or security of, radiological materials
- Excavation activities
- Erection of support buildings (e.g., construction equipment storage sheds, warehouse and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and office buildings) for use in connection with the construction of the facility
- Building of service facilities (e.g., paved roads, parking lots, railroad spurs, exterior utility and lighting systems, potable water systems, sanitary sewerage treatment facilities, and transmission lines)
- Procurement or fabrication of components or portions of the proposed facility occurring at other than the final, in-place location at the facility
- Taking any other action that has no reasonable nexus to radiological health and safety, or common defense and security
- Verify that none of the items on the construction checklist (Appendix B) have been started by the applicant (or licensee) during the preconstruction mode of operation

CHECKLIST FOR CONSTRUCTION INSPECTIONS

Regulation 10 CFR 40.4 defines construction as the installation of wells associated with radiological operations (e.g., production, injection, or monitoring well networks associated with in situ recovery or other facilities), the installation of foundations, or in-place assembly, erection, fabrication, or testing for any structure, system, or component of a facility or activity subject to the regulations in this part that are related to radiological safety or security. This appendix provides a checklist of proposed topics that should be considered during inspections of construction activities. This checklist includes generic topics for different types of sites. Depending on the type of site, some sections or items may not be applicable. A site-specific inspection plan may be appropriate to ensure that all construction activities have been sufficiently addressed.

01.01 Mill Site/Central Processing Plant/Satellite Structures

- Plant equipment constructed in accordance with layout drawings
- Plant flow paths agree with application commitments including purge/bleed pathways
- Plant design includes spill containment and ventilation features as required by the application
- Plant equipment vented to atmosphere to control radon releases
- Interlocks, alarms, and controls are installed to monitor pipeline pressures and flows and to initiate safety shutdowns
- Connections, piping, and equipment are available to support loading and unloading of resins in tankers
- Uranium precipitation circuit is constructed in accordance with the application
- Yellowcake dryer controls, interlocks, and alarms meet application commitments
- Yellowcake packaging equipment constructed with a future emphasis on worker protection
- Chemical storage tanks and associated controls and connections have been constructed with an emphasis on containment and worker safety
- Wastewater management equipment constructed per application commitments

- Water filtration equipment constructed including reverse osmosis equipment, deep disposal wells, and radium/selenium removal filtration systems
- Vanadium and selenium treatment/removal equipment installed in accordance with license application commitments
- Gaseous and airborne particulate monitors installed at locations required by license

01.02 Wellfields/Header Houses

- Header houses constructed in accordance with commitments including ventilation, leak detection, and physical access controls
- Equipment, instrumentation, interlocks, and controls constructed within individual header houses
- Injection and recovery wells installed in accordance with commitments; leak detection installed in wellfield as required by license
- Piping is buried as specified in the application; piping is pressure tested after construction
- Mechanical integrity tests of wells conducted in accordance with license requirements and procedures; wells that fail are repaired or plugged in accordance with license and site procedures
- Injection and recovery well patterns agree with commitments
- Underground injection control wells (Class 1 disposal wells) constructed per permits
- Abandoned exploration holes have been plugged per license application or state requirements to avoid vertical excursions

01.03 Disposal Cell and Impoundment Construction

- Refer to IP 89010, "Disposal Cell Construction at Uranium Recovery and 11e.(2) Byproduct Material Facilities," for detailed information about this inspection area
- Disposal cell construction conducted as described in technical specifications or similar document
- Work conducted in accordance with construction quality assurance/quality control plan
- Quality assurance/quality control tests (compaction tests, for example) being conducted at frequencies established in technical specifications using industry standards
- Solar evaporation ponds constructed in accordance with application or permit requirements including leak detection equipment
- Equipment and piping installed to transfer water from pond to pond as needed

01.04 Monitoring Network

- Monitoring and excursion wells installed in locations and depths specified in application
- Environmental monitoring stations constructed in locations specified in application
- Environmental monitoring stations in service collecting background data
- Licensee collected or will collect non-continuous environmental monitoring samples including soil, vegetation, and surface water samples prior to operations

01.05 Site Boundaries

- Site access gates installed and posted (or ready to be posted)
- Site gates capable of being locked or electronically controlled
- Site fences installed and posted as necessary
- Are there any rights-of-way that traverse through licensed property such as power lines, gas lines, or oil/gas wells that may impact operations or access control?

01.06 Decommissioning and Groundwater Reclamation Equipment

- Groundwater restoration equipment installed in accordance with license application or license requirements including reverse osmosis units, ion exchange units, and evaporation ponds
- Flow paths have been established in accordance with license and procedural requirements including purge/bleed pathways
- Chemicals for use during groundwater restoration are staged and connected to flow path

01.07 Other Inspection Areas

- Equipment for land application has been installed in accordance with the application
- Licensee has implemented performance-based license conditions in accordance with license, license application, and procedure requirements
- Review selected changes made by licensee using performance-based license requirements
- Are there any historic or cultural areas that may be impacted by construction activities?

END

CHECKLIST FOR PREOPERATIONAL INSPECTIONS

This appendix provides a list of proposed inspection topics that should be considered during a preoperational inspection. The list applies primarily to new in situ recovery facilities, and the list should be modified if a different type of site is inspected. A site-specific inspection plan may be beneficial if the inspection involves multiple inspectors.

01.01 Staffing and Training

- Management level positions are staffed with qualified individuals
- Support staff positions are filled with qualified individuals including radiation safety, laboratory, environmental monitoring, and operations
- Licensee has plans to expand staff when operations expand
- Training programs are established for major program areas including emergency response, radiation protection, and routine operations including on-the-job and equipment use training
- Training program established for staff involved in transportation-related activities
- Radiological training programs established for visitors and site staff including annual refresher training
- Training program in place for management of chemicals including hazardous worker training (may be license application commitment)
- Completion of training necessary to begin plant startup and operations
- Posting of notices to workers per 10 CFR Part 19
- Mechanisms in place to track employee training and training due dates
- Respirator program in place including initial training, medical examinations, and fit-testing
- Licensee commitment to As Low As Is Reasonably Achievable (ALARA) program
- Licensee commitment to Safety Conscious Work Environment (SCWE) program

01.02 Programs and Procedures

- Performance-based license provisions have been implemented including staffing of plant review committee (sometimes called the safety and environmental review panel)
- Program to control cultural resources as the site footprint expands
- Procedures for routine audits, program reviews, and site inspections
- Administrative requirements in place for routine procedure reviews and managing incoming generic communications
- Quality assurance and quality control programs established including identification of deficiencies and implementation of corrective actions
- Program established to verify compliance with the Additional Protocol requirements as specified in 10 CFR Part 75 (as applicable)
- Procedure in place for reporting of non-routine events and incidents, including 10 CFR Part 21 defects (as applicable)
- Program for acceptance of equivalent feed from water treatment plants or mine dewatering operations (as applicable)
- Permits available for wells including deep disposal wells
- Procedures for routine operations, excursion monitoring, environmental monitoring, etc.
- Safety plan and implementing procedures for confined spaces, tagout/lock control, hot work permits, and chemical safety (may be license application commitment)
- Radiation safety plan and associated procedures for radiation work permits, bioassays, dosimetry, monitoring and sampling, and instrument calibrations
- Procedures in place for operation and routine testing of emergency equipment such as fire protection, emergency power supplies, and chemical containment
- Logs and forms for recording plant parameters (flow, temperature, pressure, etc.) have been established
- Wellfield operational procedures in place for wellfield bleed and excursion monitoring
- Emergency response procedures available for spills, excursions, transportation events, and onsite accident response
- Agreements in place with local law enforcement, fire departments, and medical facilities for emergency response support
- Procedure established for routine reports as required by NRC regulations and license conditions

- Procedure established for transportation of radioactive material including movement of contaminated equipment across the site; program must include record retention requirements
- Procedures for control of solid and liquid radwaste
- Radioactive waste disposal agreement in place (if required by license)

01.03 Plant and Equipment

- Plant/site has been constructed to the point that operations can begin
- Plant flow paths agree with drawings and license requirements
- Wellfield flow patterns have been balanced as required by procedure; injection pressures will be monitored and controlled per application
- Wellfield bleed pathways have been constructed and tested
- Water retention impoundments have been constructed and permitted for use
- Equipment tests completed including hydrostatic pressure tests, pump tests
- Uranium dryer installed with interlocks and alarms; interlocks and alarms have been tested
- Critical plant alarms have been installed and tested
- Support equipment in service for non-routine and emergency operations (backup generators, fire protection, spill detection equipment)
- Equipment for emergency responses has been staged and is available for use
- Instrumentation available to monitor for radioactivity and radiation
- Equipment can meet minimum detectable activities (MDAs) and critical levels (Lc) specified in license or application for radiation protection, effluent monitoring, and environmental monitoring programs
- Radiological posting (signs, boundary markers) available when plant starts to operate
- Equipment available for radiological air sampling, dose monitoring, and bioassays
- Personnel protective equipment available for contamination control
- Environmental monitoring stations are in service at locations specified in application
- Effluent monitoring equipment in place to monitor liquid and gaseous effluents

- Chemicals available to support operations
- Access control measures in place or ready to be placed into service at start of plant operations (postings, gates, fences, door locks, etc.)
- Receptacles are available for radioactive solid wastes such as labeled trash bins, dumpsters, etc.

END

Attachment 1: Revision History for IP 89015

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number
N/A	ML21202A336 10/08/21 CN21-034	New inspection procedure originally based on IP 83822, Radiation Protection	n/a	ML21202A334