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## INSPECTION PROCEDURE 81000.11

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### MATERIAL CONTROL AND ACCOUNTING (MC&A)

Effective Date: January 1, 2025

PROGRAM APPLICABILITY: IMCs 2200 A, 2562

#### 81000.11-01 INSPECTION OBJECTIVES

- 01.01 To verify the licensee has developed and is properly implementing or is prepared to implement an adequate and effective program to control and account for the special nuclear material (SNM) in its possession.
- 01.02 To verify the licensee has developed and is properly implementing or is prepared to implement an MC&A program to detect loss, theft, or diversion of SNM in a timely manner.

#### 81000.11-02 INSPECTION REQUIREMENTS

##### General Guidance

This inspection procedure (IP) was developed to ensure the operational program established for implementation at a plant licensed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 and 10 CFR Part 52 meet all NRC requirements and objectives for operational program readiness. Note that this inspection is conducted as licensees activate their operational program in accordance with IMC 2200, Appendix A, "Security Construction Inspection Program," or IMC 2562, "Light Water Reactor Inspection Program for Restart of Reactor Facilities Following Permanent Cessation of Power Operations." For reactors under construction, this IP is applicable to all power reactors under construction that are subject to oversight under the NRC's Construction Reactor Oversight Process (cROP). For restart of reactor facilities following termination of an operating license, this IP is applicable for transitioning from a decommissioned or extended shutdown reactor facility to an operational power reactor facility subject to the Reactor Oversight Process (ROP). Therefore, verification through observation of activities may not be possible. In such cases, the inspector(s) should review the appropriate licensee procedures and conduct inspections of all associated areas to ensure program compliance upon implementation.

MC&A and physical protection are complementary measures taken by the licensee to ensure that nuclear material is not lost, stolen, or diverted. Physical protection is a set of activities for protecting SNM and the facilities in which it is used. MC&A is a set of activities that enable the licensee and the NRC to confirm in a timely manner that SNM has not been lost, stolen, or diverted.

MC&A programs at power reactors, including those under construction, and those transitioning from a decommissioned or extended shutdown reactor facility to an operational power reactor

facility, have three components: records, procedures, and inventory. The requirements for each of these components are specified in 10 CFR 74.19. Complete records are required of all SNM transactions. Without complete and accurate records, detecting loss or theft would not be possible. Written procedures are required, which are sufficient to control and account for the SNM possessed. Written procedures describe the methods of control and instruct licensee staff about the documentation of transactions. A physical inventory of all SNM is required at least once every 12 months. Physical inventory confirms that the records are correct. Discrepancies that are discovered within 12 months are more likely to be resolved than those discovered later, because the information is fresh, and personnel involved in the SNM activity, or the recording of the activity are more likely to be available to respond to an investigation. Additionally, certain reports are required by 10 CFR 74.13 and 10 CFR 74.15. Should questions arise regarding procedural requirements or guidance, the inspector(s) should consult with Regional Management or the Office of Nuclear Material Safety and Safeguards for clarification.

MC&A inspections at power reactors under construction, or reactors transitioning from a decommissioned or extended shutdown reactor facility to an operational power reactor facility primarily involve a review of the licensee's programs and procedures for controlling and accounting for discrete items, and a program for physical verification of the inventory. The review should address the adequacy and completeness of the physical inventory program.

Depending on when this inspection is conducted, it may be worthwhile, but not essential to conduct this inspection when the licensee is conducting activities with MC&A implications (such as, fuel movement, reconstitution, or physical inventory).

The inspector(s) are responsible for ensuring that every sample in the IP is completed and evaluated to a level which provides adequate assurance that licensees are meeting NRC regulatory requirements within the MC&A program.

Correspondence pertaining to MC&A is to be marked as "Official Use Only Security Related Information" as described in NRC's policy for handling, marking, and protecting Sensitive Unclassified Non-Safeguards Information.

#### 02.01 MC&A Procedures

- a. **Verify the licensee has developed, implemented, or is prepared to implement procedures for MC&A that are sufficient to enable the licensee to account for the SNM in its possession. (10 CFR 74.19(b))**

##### Specific Guidance

The inspector(s) should review the licensees MC&A related procedures. The MC&A procedures should be approved by licensee management. SNM duties and responsibilities should be clearly documented.

The licensee is required to establish and maintain written MC&A procedures to ensure that current knowledge of the identity, quantity, and location of all items containing SNM in its possession is maintained. Other procedures in addition to the general MC&A procedure should include MC&A instructions; procedures for fuel handling, fuel receipt, receipt of other non-fuel SNM such as instruments, movement of SNM (fuel and non-fuel

items), assembly repair and reconstitution, fuel shipment, instrument replacement, core loading, fuel shuffle, and oversight of contractors working in the spent fuel pool.

Procedures should clearly identify who in the organization has responsibility for each aspect of the site's activities for control and accounting of SNM, both fuel and non-fuel SNM. Movements of SNM are conducted in accordance with approved procedures. Oversight of vendors performing operations in the spent fuel pool should include clear responsibility for movement of SNM and keeping records of SNM.

All personnel and contractors with potential for access to SNM should be trained on pertinent MC&A procedures. The licensee should have procedures in place that would prevent placing fuel pieces (rods, rod pieces, rod fragments, instruments, unclad pellets, etc.) in a shipping cask with irradiated hardware and inadvertently shipping them to a low-level waste burial site.

If changes were made to MC&A related procedures since the last inspection, ensure these changes were reviewed and approved by licensee management, personnel were trained on the changes to the procedures, and that the changes did not decrease the effectiveness of the MC&A program.

Additional guidance can be found in American National Standards, Inc. (ANSI) N15.8- 2009, "Special Nuclear Material Control and Accounting Systems for Nuclear Power Reactors,".

## 02.02 SNM Records

- a. **Verify the licensee has developed, implemented, or is prepared to implement a record retention process showing the receipt, inventory, acquisition, transfer, and disposal of all SNM in its possession. (10 CFR 74.19(a)(1) and 10 CFR 74.19(a)(3))**

### Specific Guidance

The inspector(s) should review records and procedures to ensure that MC&A related activities involving fuel and non-fuel SNM (instruments) are documented. The licensee is required to document all SNM transactions. MC&A related transactions include, but are not limited to, receipt of new fuel, instruments containing SNM (detectors), movement, physical inventory including location and unique identity, acquisitions, shipments including items off-site, movement within and between item control areas, transfer of irradiated fuel to an independent spent fuel installation (ISFSI), losses and disposal, fuel failures, and reconstitution.

SNM items involved in transactions include fuel assemblies, rods, rod pieces or fragments, pellets (or significant fraction thereof), and non-fuel SNM instruments, such as sealed sources and fission chambers. Records typically include transfer forms, file cards or computer records for each fuel assembly, physical inventory records, core maps, fresh fuel maps, and spent fuel pool maps. Spent fuel pool maps show the location of all assemblies in the spent fuel pool, they should also show the location of SNM items (if there are any) other than assemblies.

If fuel is damaged, records should clearly document the creation of individual rod pieces and pellets as well as their final disposition. The licensee is required to account for all SNM and promptly report any losses. SNM records are required to be retained as long

as the licensee possesses the SNM and for 3 years following transfer or disposal of the SNM. For additional guidance, the inspector(s) should reference ANSI N15.8-2009, section 7.6.

## 02.03 Physical Inventory

- a. **Verify the licensee has developed, implemented, or is prepared to implement a physical inventory program and the licensee conducts a physical inventory of all SNM in its possession at intervals not to exceed 12 months. (10 CFR 74.19(c))**

### Specific Guidance

The inspector(s) should review the licensee procedures and practices to ensure the physical inventory includes physical observation of each item and that the licensee is not merely conducting a records review.

If the licensee has already implemented a physical inventory program and completed a physical inventory, the inspector(s) should compare the results of the last two physical inventories. The results of the physical inventory should be compared with the book inventory on an item-by-item basis. The reconciliation should be adequate to reveal if an item is missing from either the physical or book inventory. Documents should be updated to reflect the results of the physical inventory. Failure to identify discrepancies between the physical inventory and the book inventory (generally the spent fuel pool map) increases the risk of failing to identify an item is missing. Every discrepancy should be investigated thoroughly and explained satisfactorily.

In the case of closed containers of SNM pieces, provisions should be made to assure that removal of the contents are observable. As a general rule, the contents are adequately protected if the protection to the content is equivalent to the protection provided to rods by the bolts that secure the top nozzle on the assembly. Tamper-indicating devices can be used to provide assurance that the contents have not been disturbed. A closed and appropriately sealed container, for which the licensee has a record that indicated the contents were confirmed previously by a physical inventory does not need to be physically inventoried for content every 12 months, provided there is a sufficient basis (e.g., tamper-indicating device) that provides reasonable assurance that the closed container has not been opened or the contents manipulated. In such case, the licensee only needs to account for the presence of the container to meet the physical inventory requirement. Otherwise, the container should be opened and the contents physically observed.

Items containing SNM should be clearly identified so it's not mistaken for non-SNM. Areas that preclude visual examination due to very high radiation, such as the inside of the reactor vessel when the reactor is at full power are exempt from actual physical inventory. The current core load maps are sufficient for listing the inventory of the SNM in operating cores. However, radioactivity is not an excuse for failing to physically observe instruments or items of irradiated fuel, unless the licensee has instituted

complementary protective measures and receive an approved NRC exemption from this portion of the inventory requirement.

If SNM is present when the inspection is conducted then 1 through 4 below should be performed by the inspector(s). Otherwise, steps 1 through 4 are not performed.

The following locations are examples of where the licensee should be conducting a physical inventory to include but are not limited to:

1. Fuel assemblies in the spent fuel pool (and the core if its open and accessible)

The inspector(s) should item count 100 % of the assemblies in the pool and in the core (if material is present and accessible). If 100 % item count is performed no identification number check is needed. Alternatively, the inspector(s) should randomly select 10 % of the fuel assemblies from the pool (core) map and verify through physical observation (including identification number), or through a video review of activities that the fuel assemblies are in their assigned locations in the spent fuel pool (core). Additionally, as applicable, the inspector(s) should tour the spent fuel pool areas with knowledgeable licensee personnel and verify that all baskets and other containers of SNM hanging from the side of the pool are clearly identified.

2. Containers with rods, rod fragments, and other components

As applicable, the inspector(s) should verify through physical observation, or through a video review of activities that containers with rods, rod fragments, pellets, or any other pieces of fuel are in their assigned location and that the contents have not been accessed or removed.

3. Non-fuel SNM (detectors)

Installed material need not be item counted. Uninstalled material, when accessible, should be item counted. Material in containers may be item counted by visual observation of the container.

4. New fuel storage area

Fresh Fuel should be 100% item counted.

02.04 SNM Material Status and Transaction Reports

- a. **Verify the licensee has developed, implemented, or is prepared to implement a process to distribute the required SNM material status and transaction reports to the National Nuclear Materials Management and Safeguards System (NMMSS). (10 CFR 74.13(a) and 10 CFR 74.15)**

Specific Guidance

As applicable, the inspector(s) should interview licensee personnel and conduct a records review to determine if the licensee has a process in place to make or has made the required material status and transaction reports to the NMMSS in accordance with NUREG/BR-0006, "Instructions for Completing Nuclear Material Transaction Reports (Department of Energy/Nuclear Regulatory Commission (DOE/NRC) Forms 741 and

740M),” and NUREG/BR-007, “Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C).”

Licensees that possess SNM are required to submit periodic reports to NMMSS. DOE/NRC Form 741 is used to report transfers and receipts of SNM greater than 1 gram between licensees. Records of plutonium production and nuclear consumption (burn-up) are also reported on transaction reports. To support the required reports and possible transfer off-site or to an Independent Spent Fuel Storage Installation, the licensee should have developed, implemented or is prepared to implement procedures for calculation burn-up, washout, and production of SNM. Records should be updated assigning current SNM estimates to all items containing SNM. The inspector(s) do not need to verify the calculations, just verify that the calculations are being made and reported as required.

Form 742 is used to report the material balance of SNM that the licensee has received, produced, possessed transferred, consumed, disposed of, or lost.

## 02.05 Reviews

- a. **Events and Logs. Review and evaluate licensee event reports, safeguard log entries, and corrective action documents for the previous 12 months, or since the last inspection, as applicable, for events associated with 81000.11, “Material Control and Accounting”, and follow-up as appropriate. Review any written follow-up reports of MC&A events associated with 81000.11, “MC&A.” (10 CFR 74.11 and 10 CFR 73.1200)**

**Identification and Resolution of Problems. Verify that the licensee is identifying issues related to the MC&A program at an appropriate threshold and entering them into the licensee’s problem identification and resolution program. Verify that the licensee has appropriately resolved the issues regarding regulatory requirements for a selected sample of problems associated with the MC&A program.**

### Specific Guidance

Before the inspection, the inspector(s) should determine if a licensee event report (LER), in accordance with 10 CFR 74.11 and 10 CFR 73.1200 has been submitted to the NRC by the licensee. The inspector(s) should assess if additional follow up under this IP is warranted for the conditions or corrective actions associated with the LER.

Before the inspection, the inspector(s) should review and evaluate safeguards log entries since the last inspection (if applicable) that are associated with the MC&A program. If discrepancies or deficiencies are identified during this review, the inspector(s) should follow up as necessary.

The inspector(s) should review a sample of entries in the licensee’s problem identification and resolution program associated with the MC&A program. The intent of this review is to verify that the licensee is identifying deficiencies at the appropriate threshold, tracking deficiencies for trending, and correcting deficiencies commensurate with their significance. Inspectors can follow up on selected samples in accordance with this procedure to ensure corrective actions are commensurate with the significance of the issue.

#### 81000.11-03 RESOURCE ESTIMATE

The resource estimate for the completion of this procedure consists of approximately 6 plus/minus 2 hours of direct inspection effort onsite if no material is present and 16 plus/minus 2 hours if material is present.

#### 81000.11-04 PROCEDURE COMPLETION

The sample size for this procedure is 5. This inspection procedure is to be conducted prior to fuel or detector receipt, to verify the completeness and adequacy of the licensee's SNM program and procedures. In some cases where the procedure is conducted for restart after a prolonged shutdown, material from previous operation may be present.

#### 81000.11-05 REFERENCES

American National Standards Institute, Inc. (ANSI) N15.8-1974, "Nuclear Material Control Systems for Nuclear Power Reactors"

ANSI N15.8-2009, "Special Nuclear Material Control and Accounting Systems for Nuclear Power Reactors"

Bulletin 2005-01, "Material Control and Accounting at Reactors and Wet Spent Fuel Storage Facilities," dated February 11, 2005 (ML050390228)

IP 85102, "Material Control and Accounting-Reactors"

"Material Control and Accounting at Nuclear Power Plants and Wet Storage Sites," Report of results of inspection conducted under TI 2515/154 (ML072841277)

NUREG/BR-0006, "Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M)"

NUREG/BR-0007, "Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C)"

Regulatory Guide (RG) 5.29, "Nuclear Material Control Systems for Nuclear Power Plants"

RG 5.49, "Internal Transfers of Special Nuclear Material"

SECY-08-0005, "Results of Material Control and Accounting Baseline Inspections Conducted at Nuclear Power Reactors and Wet Storage Sites," dated January 8, 2008 (Agencywide Documents and Access Management System (ML072841281)

Temporary Inspection (TI) 2515/154, "Material Control and Accounting at Nuclear Power Plants and Wet Storage Sites," Revision 2, dated January 12, 2007 (ML062900249)

List of Attachments

Attachment 1: Revision History for IP 81000.11

END

Attachment 1: Revision History for IP 81000.11

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional Non-Public Information)
N/A	ML12114A179 09/07/12 CN 12-020	Researched commitments made in the last four years and found none. IP developed to support security construction inspections under IMC 2200.	Training to be covered at the July 2013 Annual NSIR Counterpart Meeting.	N/A
N/A	ML24191A399 11/22/24 CN 24-037	This document has been revised as a result of a periodic review, as well as the Palisades restart effort. This is a major revision therefore there are no track changes. Revisions were made to the IP to coincide with IP 71130.11, as a result of the review, editorial changes to adhere to IMC 0040, as well as the addition of IMC 2562 to the program applicability.	N/A	ML24191A397