

NRC INSPECTION MANUAL

NSIR

TEMPORARY INSTRUCTION 2515/154

SPENT FUEL MATERIAL CONTROL AND ACCOUNTING AT NUCLEAR POWER PLANTS

FUNCTIONAL AREA: Physical Protection Cornerstone

APPLICABILITY: Operating and Decommissioned Power Reactors and Wet Storage Sites

2515/154-01 OBJECTIVE

01.01 To gather site specific material control and accounting (MC&A) program information, in order to determine if the MC&A issues at Millstone Unit 1 regarding the loss of two spent fuel rods, are applicable to other power reactors.

01.02 Obtain enough information to determine if: (1) MC&A guidance for power reactors should be modified to reduce the possibility of a licensee losing spent fuel rods in the future, (2) the licensee can account for all spent fuel, including any rods that have been separated from their parent assembly, and (3) all items of spent fuel listed in the spent fuel inventory, including rods that have been separated from their parent assembly, can be located in the spent fuel pool.

01.03 To obtain site specific MC&A data for the purposes of program development of the power reactor MC&A program. Several inspection activities associated with this temporary instruction (TI) are not aimed at inspecting against regulatory requirements, but at inspecting conditions that may give indications for future MC&A program improvement.

2515/154-02 BACKGROUND

In June 2000, the Millstone Unit 1 licensee determined that two full-length irradiated fuel rods were not in the locations reflected in special nuclear material accounting records. The two rods had originally been part of a fuel assembly which was disassembled in 1972 for inspection. When the assembly was reassembled in 1974, the center spacer capture rod and a tie rod were left out because they were bent. They were placed in a container for individual fuel rods and stored in the spent fuel pool. Records dated 1979 and 1980 show the fuel rods in the container in the spent fuel pool. However, spent fuel pool map records

after 1980 do not show either the fuel rods or the container. Records do not indicate what happened to these rods. Investigations by the licensee centered on significant spent fuel pool activities that occurred between 1980 and 1992, which are potentially related to the missing fuel rods, including two re-racks and several shipments of irradiated non-fuel components.

2515/154-03 RESPONSIBILITIES AND AUTHORITIES

03.01 Regional Branch Chiefs

- a. Schedule review of this TI as part of a routine or other safeguards inspection, as appropriate.
- b. Notify the Chief, Safeguards Oversight Section, Division of Nuclear Security, Office of Nuclear Security and Incident Response (NSIR/DNS/SOS), who will inform the Chief of the Inspection Program Branch (NRR/DIPM/IIPB) of the results of this TI, when it has been completed.

2515/154-04 INSPECTION REQUIREMENTS

This is a three-phase TI. Phase I is to be conducted utilizing regional or site inspection resources and is to be applied at every power reactor site, decommissioning power reactor site that has a spent fuel pool, and wet storage facility. Phase II is to be conducted utilizing regional or site inspection resources at those sites identified in Phase I as requiring additional effort, as described in 04.01. Phase III will be implemented at 12 selected sites for the purpose of validating the Phase II results. The sites will be selected by NRC headquarters, based on analysis of the data collected in Phases I and II. In addition to the 12 sites, any sites which have a “no” answer to any question in Phase II will be considered for Phase III. Sites will be selected for Phase III after results from Phase II have been analyzed. Phase III will be conducted by third party personnel with MC&A expertise. (Resource requirements are addressed in Paragraph 11.)

04.01 PHASE I. Determine through interviews and spent fuel pool records whether or not the licensee has ever removed irradiated fuel rods (pins) from an assembly or reconstituted fuel assemblies. If the licensee has never removed irradiated fuel rods (pins) from an assembly or reconstituted fuel assemblies, report this as described in 03.01.b, and do not conduct Phase II. If the licensee has removed irradiated fuel rods (pins) from an assembly or reconstituted fuel assemblies, then perform Phase II of the TI.

04.02 PHASE II. Using inspection and interviews, answer the questions in Attachment A to this TI. The response, yes or no, should cover the life of the plant. For example, if the plant is 15 years old, the response should cover not only current practice, but also practice at the plant 15 years ago, 10 years ago, and 5 years ago. If based on current practice alone the answer to the question is “yes”, but based on past practice the answer is “no”, then the question should be answered “no”. Phase II of this TI is not intended to provide detailed information concerning the location of every fuel rod (pin) separated from its assembly. Phase II of this TI is intended to provide general information concerning the licensee’s MC&A program.

04.03 PHASE III. This phase expands on the questions in Phase II. It applies to a sample of sites, as described above, which includes sites that have answered “no” to any of the questions in Phase II. The questions in Attachment B to this TI will form the basis for the conduct of Phase III.

2515/154-05 GUIDANCE

None provided

2515/154-06 REPORTING REQUIREMENTS

For Phase I the inspector shall document whether or not the licensee has ever removed irradiated fuel rods from a parent assembly and provide this documentation to management as listed in section 03.01 and the contacts listed in this TI. If Phase II is required, the inspector shall fill out the MC&A questionnaire and provide narrative explanatory information, if warranted. Results of the Phase II inspection shall be submitted to management as listed in section 03.01 and the contacts listed in this TI. Provide results of Phases I and II within two weeks of completion. Personnel conducting Phase III shall document completion of the Phase III TI requirements in a report. Details of the Phase III inspection should be sufficient to allow for a thorough analysis of the resultant data.

2515/154-07 COMPLETION SCHEDULE

Phase I and Phase II, if called for, shall be completed for each applicable site within six months after the TI is issued. Phase III will be initiated after the completion of Phases I and II and completed within 18 months after the TI is issued.

2515/154-08 EXPIRATION

This TI will expire two years from the date of issuance.

2515/154-09 CONTACT

Questions regarding the technical aspects of this TI should be addressed to Martha Williams at (301) 415-7878.

2515/154-10 STATISTICAL DATA REPORTING

All direct inspection effort expended on this TI is to be charged to 2515/154 for RITS reporting with an IPE code of SI.

11.01 Organizational Responsibility. This TI was initiated by the Office of Nuclear Security and Incident Response.

11.02 Resource Estimate. Phase I and Phase II, if required as described in 04.01, will be completed by the Resident Inspector. The direct inspection effort to perform Phases I and II of this TI is estimated to be 8-16 hours per site. Phase III will be conducted by MC&A experts. Direct inspection effort to perform Phase III is estimated at 12-24 hours per site.

11.03 Training. NRC headquarters staff (NSIR and NRR) will train personnel conducting the Phase I and II inspections. This training will include reviewing the TI with the inspectors, explaining the intent and scope of the activities, and answering pertinent questions.

In addition, prior to performing Phase II of this TI an inspector should review the MC&A requirements and guidance for power reactors contained in (1) 10 CFR 74.19; (2) Regulatory Guide 5.49, "Internal Transfers of Special Nuclear Material"; and (3) Regulatory Guide 5.29, "Nuclear Material Control Systems for Nuclear Power Plants". Regulatory Guide 5.29 endorses ANSI N15.8-1974, "Nuclear Material Control Systems for Nuclear Power Plants", which provides guidelines for recording the identity of each fuel assembly or fuel element and its location in the irradiated fuel area. The ANSI standard and Regulatory Guide 5.29 were withdrawn in 1987 and 1998, respectively. However, withdrawal of the Regulatory Guide does not alter any existing licensing conditions or commitments that were based on it.

END

Attachments:

Attachment A - Phase II

Attachment B - Phase III

ATTACHMENT A - PHASE II

- a. Does the licensee have a program that tracks individual fuel rods from the point of removal from a fuel assembly, to where they are stored in the spent fuel pool, and to their final destination? yes no
- b. Obtain from the licensee a list of all irradiated (or spent) fuel rods that have been removed from their parent assembly. (Exclude from the list rods that were transferred off-site with proper documentation and in accordance with the applicable regulations.) Using the current spent fuel pool map (or equivalent), identify the presumed locations of the separated rods. To the extent possible, by observing from the edge of the pool, answer the following question: Are there rods in all of the locations identified on the map as containing separated rods? If the rods are stored in a closed container, report this under "Comments" below. yes no
- c. Answer the following question based on inspection of the spent fuel pool and spent fuel pool maps: Does the licensee physically separate spent fuel rods and assemblies from non-fuel components that are similar in appearance (e.g. power range monitors) in such a manner as to provide reasonable assurance that fuel and non-fuel items could not be mistaken for one another? yes no
- d. Does the licensee store all individual fuel rods in the spent fuel racks (as opposed to, for example, suspending them from the pool railing)? yes no
- e. Does the licensee have written MC&A procedures that are approved by licensee management? yes no
- f. Does the licensee maintain configuration control over the site MC&A procedures in order to assure that all copies are current ? yes no
- g. Does the licensee have written procedures for the movement of individual spent fuel rods within the spent fuel pool? yes no
- h. Does licensee documentation define roles and responsibilities for all MC&A activities? yes no
- i. Does the licensee have records that indicate which organization is responsible for documenting discrete activities within the spent fuel pool? yes no
- j. Does the licensee have procedures for performing oversight of all spent fuel pool operations? yes no
- k. Does the licensee have records documenting spent fuel pool operations conducted by contractors or fuel vendors? yes no
- l. Does the licensee perform an annual physical inventory of the spent fuel pool that includes resolution of all discrepancies? yes no

Comments (and additional information): _____

END

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ATTACHMENT B - PHASE III
(to be conducted by third party personnel with MC&A expertise)

- a. Inspect licensee documentation for all MC&A activities, including the MC&A plan, organizational charts, and definitions of roles and responsibilities. Verify that the documentation conveys, in a clear manner, what organization has responsibilities for each aspect of the site MC&A activities. Verify that the licensee prepares and maintains written MC&A procedures that are approved by licensee management. Verify that the licensee has in place programs and procedures that are adequate to control and account for all SNM in his possession, as required by 10 CFR 74.19; 74.13; and 74.15.
- b. Review licensee documentation of spent fuel bundle disassembly operations and determine if there is documentation to track individual fuel rods from the point at which they are stored in the spent fuel pool and to their final destination. If any rods have been removed from their parent assemblies, verify that records about them are adequate.
- c. Review spent fuel pool maps and determine whether or not the licensee physically segregates spent fuel assemblies/rods from non-fuel components that are similar in appearance (e.g. power range monitors) in such a manner as to provide reasonable assurance that fuel and non-fuel items could not be mistaken for one another. Determine whether individual rods that have been removed from assemblies are stored in the spent fuel racks or elsewhere.
- d. Review site documentation and verify that all physical movements of spent fuel or other components within the spent fuel pool or outside the spent fuel pool, including individual rods that have been removed from their parent assembly, have been clearly documented. Verify, through review of site documentation, that specific organizational entities are assigned responsibility for documenting discrete activities within the spent fuel pool. Verify that the licensee prepares and maintains written procedures that govern movement of spent fuel, including rods separated from the parent assembly.
- e. Through review of site documentation, determine if the licensee has an MC&A self-assessment program in place to assess the efficacy of the program and to identify deficiencies and areas for improvement. Verify that the self-assessment program looks at the following aspects of the MC&A program: roles and responsibilities for MC&A, material transfer procedures, document retention, and annual physical inventory. Verify that the licensee has documentation that indicates management follow-up actions based upon the self-assessments.
- f. Verify through the review of site documentation whether or not the licensee has implemented configuration control, in order to keep the plan current, over their MC&A plan. Verify that the method of configuration control is rigorous enough to convey changes to all copy holders in a timely and effective manner.
- g. Verify through inspection of site documentation that the licensee provides management oversight of all spent fuel pool operations, including those performed by an outside vendor, in such a manner that misplacement of fuel and non-fuel components within

the spent fuel pool would be expeditiously identified during the activities. Verify that records of spent fuel pool operations performed by vendors are prepared and retained.

- h. Verify that the licensee conducts an annual physical inventory of all SNM, including rods removed from their parent assembly. Verify through inspection of site documentation that the licensee reconciles the physical inventory with the book inventory on an annual basis, and vice versa. Verify that this reconciliation is sufficient to determine whether or not every spent fuel item listed in the accounting records and on the spent fuel pool map, including rods removed from their parent assembly, is included in the physical inventory. Determine whether or not this reconciliation is thorough and effective. In the report responding to this TI, document the physical inventory process/methods/activities in detail. In addition, describe the licensee's method of documenting the inventory, for example, the manner of preparing the spent fuel pool map and how it is updated. Indicate, if and where hand-written records are generated in the inventory process, and if and where records are computerized. Verify that records of inventory, including spent fuel maps, are retained.
- i. Select a statistical random sample of items from the current spent fuel pool map and verify their locations within the spent fuel pool. Prepare a list of all spent fuel rods that have been separated from the parent assembly, determine their recorded locations using the current spent fuel pool map, and verify their locations within the spent fuel pool.

END