INSPECTION PROCEDURE 85406

RESOLUTION PROGRAM

PROGRAM APPLICABILITY: 2683

85406-01 INSPECTION OBJECTIVES

The objectives of this inspection procedure are to verify that a resolution program exists and ensures the following:

01.01 Shipper-receiver differences (SRDs) that are statistically significant (i.e., exceed twice the combined measurement standard error) and exceed 500 grams of U-235 on a total shipment basis, and also on an individual batch basis when subject to 10 CFR Part 75, for all special nuclear material (SNM) are investigated and resolved, or if not resolved are reported to the appropriate NRC safeguards licensing authority.

01.02 Indications of missing SNM are resolved.

01.03 Aid is provided in the investigation and recovery of missing SNM.

01.04 Indications of missing SNM that cannot be resolved within 72 hours are reported to NRC.

85406-02 INSPECTION REQUIREMENTS

The inspector should ensure that the licensee has implemented a resolution program that is capable of the timely resolution of SRDs and of potential indicators of missing SNM. The inspector should review the following:

02.01 SRD and indicator resolution procedures.

02.02 SRD investigation and resolution activities and records.

02.03 Program procedures, records, and documentation of indications of missing SNM.

02.04 Investigation and resolution of indicators of missing SNM, and response actions to unresolved indicators of missing SNM.

02.05 Informational aids (records, data, and reports) considered relevant in the investigation of incidents.

85406-03 INSPECTION GUIDANCE

General Guidance

The resolution program must be effectively implemented. The program should be capable of resolving indications of SNM missing from shipments or from the licensee's possession. Conclusions that the indicators may be true should be reported to NRC within 1 hour, pursuant to 10 CFR 74.11, unless the event is limited to a possible loss of source material (10 CFR 74.11 requirements pertain only to SNM).

Preinspection Activities

To prepare for the inspection, the inspector should:

1. Review those portions of the fundamental nuclear material control (FNMC) plan and the license conditions pertaining to the planned inspection activities.

2. Review the previous two material control and accounting (MC&A) inspection reports for the site.

3. Review any unresolved or follow-up items from the previous inspections to be addressed during the current inspection.

4. Review the content of any communications (including information notices and bulletins) to the licensee that were issued since the last inspection.

Post-Inspection Activities

Inspection follow-up activities and inspection report generation are to be performed as described elsewhere in the *NRC Inspection Manual*.

Specific Guidance

Shipper-Receiver Differences

03.01 The inspector should verify that the container identity and integrity, seal identity and integrity, and bulk container gross weights of SNM receipts are verified by the licensee within the time limits approved in the FNMC plan. SRDs associated with a

total shipment, and also on a batch basis when subject to 10 CFR Part 75, should be evaluated for significance, for both element and isotope.

Any statistically significant SRD (whether for element only, isotope only, or both) must be investigated and resolved unless the U-235 difference is less than 500 grams. Shipping information should also be carefully checked and seal integrity examined before any container is shipped. Shipping and receiving procedures that could provide indicators of SRDs are assessed in Section 03.02, "Material Transfer Control," of Inspection Procedure 85405. The inspector should verify that the shipper's and receiver's measurement uncertainties are treated in accordance with the FNMC plan to calculate the combined measurement standard error. The SRD for either: (1) a single batch or lot (when there is one container or more per batch): or (2) the total shipment, must be regarded as significant when the SRD is both greater than 500 grams of U-235 and twice the combined standard error.

The inspector should verify the following:

a. The combined measurement standard error is calculated in accordance with the FNMC plan.

b. Limits of error at the 95 percent confidence level are assigned to shipper and receiver measurements of both element and isotope contents.

c. SRDs are compared to twice the combined measurement standard error to determine their significance.

d. Statistically significant SRDs are evaluated, reported, and investigated.

e. Procedures for evaluating SRDs are documented.

Resolution and Investigation of Shipper-Receiver Differences

03.02 The inspector should verify that SRDs for each material type are routinely monitored, and when they are determined to be statistically significant, corrective action is taken to identify and correct measurement biases when applicable. The inspector should verify that the licensee implements the procedures for investigating and resolving significant SRDs as described in the FNMC plan. The criteria for defining a resolved SRD also should be reviewed. The investigation and resolution of an SRD are inseparable because the purpose of the investigation is to locate the cause of the SRD so it can be resolved and to identify chronic causes that need to be eliminated. The goal of the investigative procedure is to achieve a best estimate of the true

amount of SNM in the shipment by locating causes of the SRD and, if possible, correcting the errors.

Resolution of a significant SRD may involve a referee (or umpire) measurement of a retainer sample(s) but not of the material weight. The resolution process should specify whose weight value is used in the resolution process if shipper's and receiver's weights differ by more than one-half of the total combined standard error. The licensee should complete the investigation of statistically significant SRDs within 3 months. The inspector should review the corrective action plans developed for significant SRDs and determine whether the stated actions were taken.

The inspector should verify the following:

a. Procedures for investigating and reporting statistically significant SRDs are documented.

b. NRC and the shipper of the nuclear material are notified of any significant SRDs.

c. Resolution of SRDs involves investigation and documentation of pertinent measurements and measurement errors by both the shipper and receiver.

d. Shipper and receiver measurements are subject to approved measurement control procedures.

e. Nuclear material with an associated statistically significant SRD in excess of 500 grams of U-235 is not processed until the differences are resolved.

f. Investigations of significant shipper-receiver quantity differences are completed within 3 months.

g. SRDs involving a discrepancy in the number of items are resolved within 30 days of detection.

h. Nuclear material transfer records are appropriately revised when an SRD is resolved.

Recognition of Indicators of Missing Uranium

03.03 The inspector should verify that the resolution program can recognize potential indicators of missing uranium involving 500 or more grams of U-235. Each specific indicator should be identified with the associated material types, operational activities (e.g., process or storage), and credible causes (including innocent causes) of an alarm.

The inspector should review the material balance calculations for each physical inventory performed since the last inspection to verify that calculations were performed correctly, as described in the FNMC plan, and to determine if any additional inventory differences (IDs) should have been investigated. If an excessive ID has been investigated and resolved, the inspector should examine the records of the investigation to verify that all potential indicators were recognized and resolved. Because the ID provides a quality assurance measure for the item control program, the investigation of an excessive ID should include a review of item monitoring data to identify potential causes and to correct discrepancies identified in the data.

By reviewing the item control program records, the inspector should determine if any indicators were produced that should have been investigated. If an indicator was investigated and resolved, the inspector should examine the records of the investigation to verify that all potential indicators were recognized and resolved.

The inspector should verify the following:

a. Indicators of and resolution procedures for potentially missing uranium are documented.

b. A high probability of an indicator being generated and recognized exists if an actual loss of material occurs.

c. Material balance closure procedures identify any significant IDs.

d. Item control procedures identify potential losses of SNM.

e. Abnormal situations that could cause or be associated with potential SNM losses are evaluated and resolved.

f. The resolution program is capable of recognizing indicators of potential SNM losses.

Investigation and Resolution of Indicators

03.04 The inspector should verify that the licensee has well-defined, systematic procedures for investigating and resolving indicators of possible missing uranium (involving 500 grams or more of U-235). Indications of loss could be caused by procedural errors, process variabilities, measurement errors (e.g., bias and uncertainty), and record-keeping mistakes, along with malevolent acts by insiders (e.g., theft or diversion). Resolution of an indicator means that the licensee has made a determination that loss or theft has not occurred and is not occurring. For each type of indicator, the licensee should have developed and documented detailed resolution procedures. The

procedures should take into account the expected differences in loss mechanisms and the necessary differences in response approaches for in-process materials, items, material types, and types of operations. The licensee should have baseline data from periods free from potential incidents against which system performance can be compared. Any investigation of an indication of a loss should provide, whenever possible:

1. The type of unauthorized activity detected.

2. The time frame within which the loss or activity could have occurred.

3. An estimate of the quantity of SNM involved.

4. The material type or physical form of the material.

5. The most probable cause(s).

6. Recommendations for precluding reoccurrence.

The inspector should determine that the licensee's indicator resolution system is able to respond promptly to indications of potential uranium loss and to determine whether the alarm was caused by an actual event or by a system error. If the cause was a system error, the program should identify that cause so that remedial actions may be taken.

Response to the indicator should be timely to ensure that indicators are investigated and resolved while memories of events preceding the alarm are fresh, materials are still available for remeasurement, and few changes in process conditions, inventories, in-process holdup, and item locations have occurred. Prompt resolution will facilitate recovery of lost”or stolen material.

Criteria should establish an objective basis for defining what constitutes resolution of an investigated indicator. The criteria should be based on the identification of specific causes or sources of incorrect data that could have contributed to the indication. However, the criteria could verify, with high probability, that no loss occurred without having identified all contributing causes of the alarm. Resolution of an indicator is a verification of the system data along with an authentication of the system description and of the characteristics that could produce an alarm. Authentication is especially important after system start-up and modifications.

A search for a missing item should not be terminated, without NRC permission, until that item is located or evidence of its destruction is obtained. Items containing less than 500 grams of U-235 are exempted from the requirements for confirmatory

evidence. Searches for missing items should not be interrupted by weekends, holidays, etc.

The inspector should examine actions taken to resolve any indicators that have occurred to determine that established procedures were followed and that alarm requirements were observed. Problems encountered in responding to indicators should be resolved, and remedial actions should be taken as necessary to meet the FNMC plan commitments. As part of the review of alarm resolution, the inspector should verify follow-up corrective actions. After an alarm has been resolved, the planned corrective actions should include MC&A system revisions, if appropriate, that provide reasonable assurance that future false alarms having the same or similar causes will be reduced.

The inspector should verify the following:

a. The resolution program for potential loss of SNM is capable of prompt response and of distinguishing between a systems error and an actual event.

b. The resolution program can ensure that alarms are resolved and that the resolution process identifies the most likely causes.

c. Facility responses to and resolution of conditions that indicate potential loss of control of SNM are documented.

d. Procedures provide a systematic and logical sequence of steps for determining the cause or causes of an indicator.

e. Responsibilities for evaluating material control indicators are documented.

f. Criteria justifying a conclusion that a particular cause of an indicator is applicable and that the indicator can be resolved are documented.

g. Conclusions for a resolved indicator are tested and validated.

h. Procedures for responding to and reporting missing items, IDs in excess of control limits, and SNM discharges exceeding acceptable limits, are documented.

i. Monitoring and control systems provide sufficient information to correctly assess alarms; localize removals; and estimate the quantity, form, and enrichment of diverted or stolen material.

j. Significant trends are identified, investigated, and reported.

k. Procedures for performing special inventories are documented and are consistent with procedures employed for routine inventories, where applicable.

l. An emergency inventory capability exists and includes provisions for maintaining the availability of forms, tags, trained personnel, inventory listing, and other items that may be needed to initiate a plant-wide physical inventory within 24 hours.

m. The resolution procedures identify MC&A system weaknesses that can cause false alarms.

n. Corrective actions are taken after resolution of an indicator.

o. The indicator resolution times comply with commitments documented in the FNMC plan.

p. The check of data for clerical mistakes and data errors is completed within 24 hours.

q. The time for completion of the resolution procedure for alarms indicating a possible loss of SNM normally does not exceed 3 calendar days.

r. Items not in their recorded locations are declared missing if not found or accounted for within 72 hours.

s. Significant recurring loss trends are reported to the NRC within 1 week of their discovery.

t. Remeasurements to confirm the contents of potentially compromised items are initiated within 1 working day from the start of the investigation and are completed within 2 more working days.

u. The resolution program is monitored to ensure consistent and acceptable application of the response procedures and to provide a basis for upgrading the procedures in the environment in which they are performed.

Response to Unresolved Indicators

The inspector should verify that response actions to unresolved indicators are clearly defined and are on a graded scale appropriate to the level of potential safeguards significance. The responsibility and authority for initiating and executing response actions also should be defined. The quality of the licensee's loss resolution capability should be such that the combination of resolution activities and resolution decisions

will permit alarms remaining unresolved after investigation to be good indicators of material loss.

Incident reporting should make NRC aware of potential incidents of safeguards significance in a timely manner so that appropriate actions can be initiated. The information to be reported should include the magnitude of the discrepancy indicated by the indicator, the investigation procedure, the status of the investigation, the operational status of the facility, the safeguards status during the period, and the planned remedial measures.

When an actual loss of SNM is indicated, the quantity of material lost or produced should be estimated. Other information that may aid in the recovery of the material (e.g., the material type, container type, and who last had responsibility for the SNM), should be generated if possible.

The inspector should verify the following:

a. Unresolved situations are reported to NRC.

b. Procedures for responding to unresolved indicators are documented.

c. Responsibilities for initiating and executing response activities are documented.

d. Processing operations are conducted in a manner to support the investigation of unresolved situations.

e. Any loss or apparent loss of SNM for which there is evidence of theft or diversion is reported to NRC within 1 hour of the determination and investigated immediately.

f. Any apparent loss of uranium that is not resolved within 3 days is reported to NRC and investigated.

Documentation of Resolution Activities

The inspector should review documentation associated with the licensee's program for the investigation, resolution, and reporting of indicators of missing uranium. As a minimum, documentation of the following should be included:

1. Reports notifying MC&A management of indicators, including the date and time the indicator was reported, the name of individual who discovered the indicator, and a description of indication.

2. Investigation findings and conclusion, including resolution status, date issued, name and signature of principal investigator, and approval signature of MC&A manager.

3. Reports made to NRC for unresolved indicators and for indicators determined to be real, including the date and time the report was made, the method of communication, and the name of the NRC staff member(s) contacted.

The documentation of resolutions should be reviewed to determine whether a cause was assigned and whether the documentation supports the assigned cause. Indicator resolution should be completed within the time periods specified in the FNMC plan. The inspector should review alarm notification procedures to ensure that all required information is reported within the time periods specified in the FNMC plan for each type of alarm response.

The inspector should verify the following:

a. Procedures specify requirements for documentation of indicator resolution activities.

b. Resolution activity and report review and approval requirements are defined.

c. Documentation of investigations supports indicator resolutions.

d. Indicator resolution is completed within specified time periods.

The inspector should review loss detection and alarm resolution records to determine whether NRC should have been notified of any alarms that were not reported.

Informational Aid for Assisting in the Investigation of Incidents

03.05 When an investigation of actual (or highly suspected) events pertaining to missing uranium is conducted by NRC and/or other government agencies, the licensee should have ready for and should provide to the investigators any information deemed relevant to the recovery of material involved in a loss, theft, or diversion. The burden is on the licensee to provide (without being asked to) all information that it recognizes as being relevant, as opposed to only providing information that the investigators are knowledgeable enough to request. This information should include production records, accountability data, and routinely prepared reports. Kinds of information that might aid the investigation are:

1. Data or observations that led the licensee to determine that a loss or theft of SNM may have occurred.

2. Data, observations, and assessments associated with attempts to resolve the indication of missing material and to investigate the findings.

The inspector should verify the following:

a. Procedures for assembling records and personnel to provide investigators with pertinent information are documented.

b. Responsibilities for directing the collection of information to assist in investigations are documented.

c. Locations and contents of reports, data, and files that could assist in the investigation of unresolved incidents are known and readily available.

84506-04 REFERENCES

Regulations

10 CFR 74.31(a)(2) and (3); 10 CFR 74.31(c)(7).

Regulatory Guides and Reports

NUREG-1065, Rev. 2, "Acceptable Standard Format and Content for The Fundamental Nuclear Material Control Plan Required for Low-Enriched Uranium Facilities," November 1995.

NUREG/CR-4108, "Development of MC&A Alarm Resolution Procedures," October 1985.

NUREG/CR-2820, "Resolution of Shipper-Receiver Differences," September 1982.

NUREG/CR-2404, "Analyzing Safeguards Alarms and Response Decisions," July 1982.

A. Lamont and R. S. Strait, "Structured Approach to SNM Anomalies Resolution," *Journal of Nuclear Materials Management*, July 1989.

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