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Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment

10 CFR Part 74
Subpart E

U.S. Nuclear Regulatory Commission

Office of Nuclear Material Safety and Safeguards

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Standard Format and Content Acceptance Criteria for the Material Control and Accounting (MC&A) Reform Amendment

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Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
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ABSTRACT

In 1987 the NRC revised the material control and accounting requirements for NRC licensees authorized to possess and use a formula quantity (i.e., 5 formula kilograms or more) of strategic special nuclear material. Those revisions issued as 10 CFR 74.51-59 require timely monitoring of in-process inventory and discrete items to detect anomalies potentially indicative of material losses. Timely detection and enhanced loss localization capabilities are beneficial to alarm resolution and also for material recovery in the event of an actual loss. NUREG-1280 was issued in 1987 to present criteria that could be used by applicants, licensees, and NRC license reviewers in the initial preparation and subsequent review of fundamental nuclear material control (FNMC) plans submitted in response to the Reform Amendment. This document is also intended for both licensees and license reviewers with respect to FNMC plan revisions. General performance objectives, system capabilities, process monitoring, item monitoring, alarm resolution, quality assurance, and accounting are addressed. This revision to NUREG-1280 is an expansion of the initial edition, which clarifies and expands upon several topics and addresses issues identified under Reform Amendment implementation experience.

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2.0 ITEM MONITORING

2.1 Item Loss Detection

Requirement

The rule requires that each licensee establish the capability to detect a 5 FKG or greater loss in item form using any statistical test that has a 99% power of detection. Detection is to occur within:

1) 30 calendar days of a Category IA loss and 60 calendar days of a Category IB loss for those items in a vault or permanently controlled access area (CAA) isolated from the rest of the MAA [§74.55(b)(1)],

2) 3 working days of a Category IA loss and 7 calendar days of a Category IB loss for items located elsewhere in the MAA except that a 5 FKG or greater loss of encapsulated SSNM components that are each at least 1 meter in length and in excess of 30 kilograms is to be detected within 30 calendar days [§74.55(b)(2)],

3) 60 calendar days for the loss of Category IB items of waste stored in a permanently CAA outside of an MAA [§74.55(b)(3)], and

4) 60 calendar days for samples in a vault or permanently CAA and 30 calendar days for samples elsewhere in the MAA for those samples each containing less than 0.05 FKG of SSNM [§74.55(b)(4)].

Pursuant to §74.55(a), items, except samples, are to be uniquely identified, quantitatively measured, with the validity of the measurement independently confirmed. Additionally, items are to be either:

1) Tamper-safed or placed in a vault or permanently CAA that provides protection at least equivalent to tamper-safing, or

2) Sealed such that removal of SSNM would be readily and permanently apparent (e.g., encapsulated).

Intent and Scope

The intent of this requirement is to ensure timely plant-wide detection of the loss of items that total 5 FKG or more. To achieve this capability, the licensee is expected to verify the presence and integrity of selected SSNM items on a periodic basis. The required frequency of tests for missing items is graded according to the relative attractiveness of the material type in the item, the ease with which the item could be diverted without

being observed, and the degree of surveillance and containment provided for by the material control and physical security systems. SSNM is not to be considered as being in item form unless it falls into at least one of the following categories:

(1) it is encapsulated,

(2) it is within a tamper-safe sealed container,

(3) it is stored within a vault,

(4) it is stored in a permanently CAA that provides protection at least equivalent to tamper-safing, or

(5) it is contained in samples each containing less than 0.05 FKG.

If SSNM is not in item form, as defined above, it must be subjected to the in-process control requirements for bulk material unless it qualifies for exemption under §74.53(a)(2), (3) or (4).

The longer detection times for losses of items from permanently CAAs take into account the added security afforded by the physical protection measures required of such areas by 10 CFR Part 73. However, this provision should not be interpreted as authorizing the placement of materials in these areas other than those already authorized pursuant to Part 73.

2.1.1 Item Identification

Describe the identification system (numeric or alpha-numeric) used to assign a unique identification to each item. The description should include the features of the system that preclude falsification or that ensure prompt detection of such attempts.

Affirmations: Each SSNM item is uniquely identified; the SSNM content is quantitatively measured; the validity of the measurement is independently confirmed and ensured through encapsulation, tamper-safing, or storage in a vault or permanently CAA that provides protection at least equivalent to tamper-safing; and a record of the identity, location, date of creation, SSNM content, and utilized measurement method is maintained.

Acceptance Criteria: The item identification system possesses attributes that ensure unique item identification, preclude falsification, or as a minimum, make prompt detection of such attempts highly probable. Factors to be considered in achieving this objective are:

- The use of tamper-safe seal numbers for unique identification represents an attractive alternative because: the same number is used for both seal and item tracking, seal numbers cannot

be altered without leaving visible evidence, and seal distribution and usage are controlled;

- The use of prenumbered containers which retain the same identification for repeat uses should generally be avoided unless detailed usage records are maintained that reflect the source and disposition of items including times to fractions of a day; and

- The use of preprinted labels or blank labels that are numbered as they are used is acceptable provided unauthorized alteration or replacement of the labels would be readily apparent to a knowledgeable observer.

2.1.2 Item Classification

Provide the basis for classifying items as material Category IB and any proposed exemptions from item control tests or from response actions, including a listing of the item categories involved and the rationale for such exemptions.

Affirmations: Items are classified as either Category IA or IB at the time they are created in order to fix the frequency of tests for item loss.

Acceptance Criteria: The methods used to classify items are consistent with those defined in Section 1.1.2 (*Material Control Tests*) for process monitoring. The record system shows whether an item has been classified as IA or IB.

2.1.3 Tamper-safing

Describe the tamper-safing procedures employed to ensure the continuing validity of previously measured and attested to SSNM values assigned to unique items.

Aspects to be addressed include: personnel involvement, types of seals, attesting to declarations, records, and inspection methods for detecting violations of item integrity.

Affirmations: Only tamper-indicating devices which are controlled and accounted for are used to maintain the validity of previously established SSNM quantities associated with items.

Acceptance Criteria: The acceptability of tamper-seals is based on an evaluation of the seal attributes in relation to time to defeat and tamper-indicating features. Seals already deemed acceptable by NRC include: Type E, Pressure-sensitive, and Steel Padlock. Other seals, such as fiber optic, may be equally acceptable. The licensee must provide the appropriate information, including references, to enable licensing reviewers to assess the adequacy of other than currently approved seals.

The control of seals and seal records precludes or makes readily apparent any attempts at illicit use of seals. Potential contributors to these objectives include commitments that:

- Seals are stored in a locked repository within a room that is locked when unoccupied,
- Blocks of seals issued to designated individuals are afforded the same level of protection,
- Preferably a single individual, but no more than three individuals, none of whom have any responsibility for seal application or destruction, is (are) designated as the seal control officer(s),
- The seal log book maintained by the control officer(s) is kept separate from the seals and stored in a locked repository,
- Individuals responsible for applying seals either have unused seals in their personal possession or place them in a limited access locked compartment. As a rule, the number of available seals issued to these individuals should be limited to a single day's use,
- The licensee has in his possession a commitment from the seal manufacturer that plates and/or dies and production residuals are controlled and protected, and
- Used Type E seals are crimped, flattened, or otherwise rendered unusable and properly disposed of.

2.1.4 Accessibility

Describe the personnel access controls, the surveillance procedures, and the records procedures for entrance and exit of personnel to and from vaults and/or permanently CAAs. If any of the above attributes are described in sufficient detail in the facility's Physical Security Plan, appropriate references may be made.

Affirmations: Vaults or permanently CAAs that are subject to 30-day (IA) or 60-day (IB) test frequencies and isolated from the rest of the MAA are operated with physical and administrative controls over personnel access such that unauthorized additions and removals of items from the storage area will be either prevented or promptly detected.

Acceptance Criteria: Storage that meets the physical security requirements for vaults, documented in Part 73, will meet the requirements of 10 CFR 74.55 for storage of items containing either Category IA or IB material.

Storage that meets the following requirements will be accepted as a CAA, isolated from the rest of the MAA for the purposes of 10 CFR 74.55:

- CAA is constructed and/or equipped with physical protection capabilities that deter and detect unauthorized access,
- Access to the storage area is limited to the minimum number of persons necessary and records are kept of the persons who enter and leave it,
- Records of the items in storage are maintained, and
- An individual within the storage area is continuously observed by another person, and all additions, removals, and movements of material are verifiable by at least two individuals.

Storage provides protection at least equivalent to tamper-safing if:

- Access to the vault or CAA is limited to the minimum number of persons necessary, and records are kept of the persons who enter and leave it,
- The personnel authorized to enter and operate the vault or CAA are not authorized to remove or handle SSNM beyond the boundaries of the vault or area unless controls are in place that would preclude an individual from surreptitiously removing an item or any portion of an untamper-sealed container,
- At all times, a person within a vault or permanently CAA is accompanied by at least one other person and all activities by any person are verifiable by another. In addition, remote surveillance, such as closed circuit television, with the capability of seeing all operators at all times is used. The remote surveillance need not be continuous if the occupants cannot determine or predict when they may be under surveillance. However, the time of remote surveillance should, on the average, equal at least 25 percent of the non-surveillance time, and any interval of non-surveillance should not exceed 5 minutes.
- The SSNM content of nontamper-safed, and unencapsulated, items is measured, independently confirmed by a second person, and the item is under the continuous surveillance of the two persons from the time of measurement until placed in a vault or CAA,

- The SSNM contents of nontamper-safed, and unencapsulated, items are verified by quantitative measurements when removed from a vault or CAA except for solid components which can be verified by a weight check. The verification measurement is equivalent to (or better than) the original measurement in terms of measurement uncertainty. The verification measurement and the original result agree within the combined measurement uncertainties. (Note: Random errors will generally be the only component of the uncertainty except in those instances where a recalibration of the measurement process has taken place.) The verification measurement also detects substitution except where it can be demonstrated that no credible substitute material is present in the vault or CAA, and

- The response actions documented in Chapter 3.0 of the FNMC plan are initiated if an unauthorized vault or CAA penetration is known or suspected to have occurred, or if the SSNM content of any container is unexplainable and significantly different from the recorded value.

2.1.5 Accounting and Control Procedures

Describe the item accounting and control procedures for items placed in and removed from secure storage. The description should include item inventory records utilized.

Affirmations:

The operating procedures of item storage areas are documented.

Every change of inventory in the storage area is recorded.

A designated individual is responsible for the operation of each such storage area.

The response actions documented in Chapter 3.0 of the FNMC plan will be initiated if one or more items are missing except where the missing items total less than 50 grams 235-uranium, 233-uranium, or plutonium.

Acceptance Criteria:

Procedures approved by the Material Control and Accountability orgainzation, are utilized and reviewed annually for all secure storage areas.

Each procedure must designate the individual responsible for that secure storage area and describe the method and inventory records used for documenting additions or withdrawals of items from the area.

2.1.6 Item Measurements

Identify the measurement systems used to quantify the SSNM content of items at item creation time. The description also must include the confirmatory measurements used to quantitatively verify the SSNM content of nontamper-safed, and unencapsulated, items placed into or removed from vault storage or a CAA that is equivalent to tamper-safing, including the controls that prevent or detect attempts at substitution.

Affirmations: Accountability and confirmatory measurement systems are identified and described in written procedures.

Acceptance Criteria: Independent confirmation of the SSNM content of items will be achieved by having a second person do the following:

- Observe the bulk measurement and sampling of the item whose contents are to be determined, or
- Observe the nondestructive analysis of the item, or
- Perform a second quantitative analysis independently that does not destroy the integrity of the item,

and

- Witness and attest to the application of an approved tamper-seal, or
- Accompany the first person and the item to a vault or permanently CAA which will provide storage equivalent to tamper-safing.

2.1.7 Item Verification

Describe the item verification procedure. The description must include:

- The inventory sampling method, including the sample size selection equations, the inventory stratification plan, and the method of selecting the actual items to be verified;
- The extent to which cyclic, dynamic, or perpetual inventory data and production records, if any, will be used to modify or supplement the sample size, sample selection, or item verification procedures; and
- The minimum loss detection sensitivity and maximum time periods between item verifications for each item stratum of material.

In the Annex, provide the rationale for the item stratification plan.

Affirmations: All items, not included in process monitoring will be included in the sample population stratification for item verification, unless exempted by §74.55(c). The appropriate power of detection and verification frequency will be used, based on category and specific item characteristics.

The presence and integrity of selected SSNM items are verified periodically. The item selection method has at least a 99% probability of detecting the loss of items plant-wide that total 5 FKG within:

- 30 calendar days from loss for Category IA items and 60 calendar days from a loss for Category IB items for items in a vault or a CAA that is isolated from the rest of the MAA,
- 3 working days from a loss for Category IA items and 7 calendar days from a loss for Category IB items located elsewhere in the MAA except for encapsulated components each measuring at least 1 meter in length and weighing in excess of 30 kilograms for which the time interval shall be 30 calendar days,
- 60 calendar days from the loss of Category IB items of waste stored in a permanently CAA outside of an MAA, and
- 60 calendar days for samples in a vault or CAA and 30 calendar days for samples elsewhere in the MAA for samples each containing less than 0.05 FKG of SSNM.

Acceptance Criteria: When incorrect descriptive information for an item, such as item type, seal number, or location, is discovered, the action to be taken will ensure that the item is located, is correctly identified, and the deficiencies in the system are corrected.

In addition to positive identification and location confirmation, item verification includes: encapsulation integrity or container integrity checks, as appropriate; and tamper-safe seal integrity check, if appropriate. Considerations related to verification include the following:

- Electronic or optical methods such as bar code readers may be used in place of manual methods to record item or seal numbers provided safeguards against falsification are in place.
- If the licensee can demonstrate that seal falsification is noncredible, seal identification can be done on a random basis provided an independent means of confirming item identity, such as unique container numbers, is utilized.

- Seal integrity checks normally encompasses visual examination and, for certain seals (e.g., Type E), physical handling. Proposed shortcuts may be justified on the basis of low strategic value, limited accessibility, frequency of checks, and backup checks by production, quality assurance, production control, etc. These must be reviewed for acceptability on a case-by-case basis.

- The magnitude of the formal item verification effort can be adjusted to take credit for other means of confirming the presence and identity of sealed items. Process control and accounting, quality control testing, and other production operations routinely generate information that can serve to verify the identity and presence of sealed items. These sources can be used in lieu of item verification provided the frequency and loss detection sensitivity requirements of the item verification procedure are met and the use of the data for this purpose is not predictable. Examples of specific sources of such data are:

  1) Records that an item was created (tamper-safing procedure applied) or transferred within the required time span, as defined in §74.55(b),

  2) Records that an item was inspected, tested, analyzed, altered, or subjected to any other production or quality assurance operation within the required time span, and

  3) Production schedules showing that a particular item was "cued up" for production planning purposes where the cuing process involved a check of identity and location.

- Any tamper-safe or encapsulated items that have been verified by such a procedure within the time span required for that category of material can be exempted from formal item verification **provided (i.e., only if)**: the prior handling or inspection activities, as indicated above, for which credit is being taken are unknown **and** unpredictable to a potential diverter, or if known **or** predictable, the items are scheduled to be physically accounted for by at least two individuals during sequential processing or inspection steps to occur during the next required test time span. To exempt such items from formal item verification, the items are simply dropped from the list of n items selected from the inventory list where n is the sample size required for verification.

The frequency of item verification tests is consistent with the maximum elapsed time intervals between the occurrence of a loss and its detection as specified in §74.55(b).

A physical inventory can serve in lieu of an item monitoring test provided all items represented by an item test are subject to verification as part of the physical inventory process, and further provided that:

a) by using the physical inventory in lieu of item monitoring tests, there is no extension in the maximum time interval between item monitoring tests for 3-day and 7-day tests; and

b) for 30-day and 60-day item tests, the physical inventory is completed within 33 calendar days and 66 calendar days, respectively, of the previous item test.

2.1.8 Sample Items

Describe the technique used to establish the sample population and how the presence of selected items will be verified. Additionally, describe how samples containing greater than 0.05 FKG will be monitored.

Affirmations: Samples each containing less than 0.050 FKG will be included in the item monitoring program, provided they contain at least 0.001 FKG.

Acceptance Criteria: Samples containing in excess of 0.05 FKG can be considered a sidestream in a bulk test performed in the originating process unit provided the samples are returned to process within 7 days. SSNM removals from such samples should be documented and the area records corrected accordingly.

Small items such as element sections and samples can be amassed in a tamper-safed container to alleviate excessive item verification. Conversely, items greater than 0.05 FKG should not be consolidated within a larger tamper-safe container for the primary purpose of reducing item verification effort.

The means of determining the number of items to be verified per class or stratum is specified. For example, the equation

$$n = N\,(1 - \beta^{1/d}) \qquad \text{or} \qquad n = N\,(1 - \beta^{x/Q})$$

is an acceptable formula for calculating the sample size required from an inventory or any subset or group of size N, where d is the minimum number of altered or missing items (defects) that could total a goal quantity (i.e., 5 FKG) and $1 - \beta$ is the desired probability of obtaining at least one defect in the sample of n items where there are d defects ($d \geq 1$) in the population of N items. The number d is a function of the amount of SSNM per item. If the SSNM content varies over the population of items,

the largest value must be used to calculate d to ensure that n is large enough to guarantee that the power of detection is at least 99%. This results in a conservative value of n, i.e., n is larger than necessary. If a smaller item content were chosen, such as the average value, an informed adversary could selectively divert only large items and thereby reduce the risk of detection. The 1/d exponent is equivalent to x/G (as shown in the alternative equation) where x is the maximum formula grams within a single item (for the stratum being tested) and G is the goal quantity.

Additional points to consider in this regard include the following:

- In those cases where the SSNM content per item is very small, the required sample size is a small fraction of the inventory. The result may even be that, in some instances the calculated sample size will be less than one. However, such items cannot be ignored. An acceptable approach would be to periodically verify one randomly selected item from the class at times chosen by random selection, such as by a random number generator.

- In some instances an entire stratum may contain less than 5 FKG. Nevertheless, such strata should be sampled like any other.

- If the number of items, N, in each strata remains reasonably constant (such as within 95 % to 105 % of a historical avcerage N) it is not necessary to recalculate the fraction of the population, n/N, to be checked each time.

- Neither the specific items to be verified in any particular instance nor items that won't be verified shall be predictable.

- Every item in a stratum has an equal probability of being selected for verification.

Items of IA type material may be treated as Category IB items and subject to the lower frequency item loss test if:

- The item is rigid and its dimensions are large enough to preclude hiding the item on an individual (i.e., at least 130 centimeters in 1 dimension, greater than 65 centimeters in each of 2 dimensions, or greater than 20 centermeters in each of 3 dimensions.),

- The weight of an item is so large that one person cannot carry the item inconspicuously. The minimum weight to meet this criterion is 50 kilograms, or

- The quantity of SSNM in the item is so small that a large number of diversions are needed to accumulate 5 FKG. The maximum quantity to meet this criterion is 50 formula grams per item.

The first two exceptions (for item test frequency), given above, do not apply if the item can be opened or disassembled and part or all of the SSNM removed without a high probability of being observed or detected.

The presence of very large (higher tier) components such as fuel blocks, preassemblies, subassemblies, etc., stored outside of a CAA must be verified in accordance with a sampling plan that provides the capability to detect a 5 FKG loss within 30 calendar days. One month is deemed to be acceptable on the basis of the large physical size and weight of these items and the restrictions on removing them from the MAA.

The number of items to be verified is sufficient to give a power of detection of at least 99% for a loss of items totaling 5 or more FKG from each stratum or inventory subdivision (a grouping into similar types and amounts of SSNM). If all strata in a facility are sampled for verification with at least a 99% power of detecting a loss of items containing 5 FKG, that criterion also will be achieved for a loss of items containing 5 FKG or more plant-wide.

The item inventory is stratified or subdivided in a manner that ensures at least a 99% power of detection while minimizing the number of items to be verified. It is advantageous to subdivide the inventory into classes or strata having approximately uniform quantities of SSNM per item. A moderate range of SSNM contents within a class, such as $\pm$ 10% to 20% is tolerable. However, regardless of the variability of SSNM content per item, the maximum item content (for the stratum in question) must be used when determining the minimum number of items that could constitute a 5 FKG loss (and hence determine the number of items that make up the sample size n). Typical classes for sampling are fuel elements, containers of scrap, containers of feed material, containers of waste, etc.

Encapsulated items containing less than 100 grams of SSNM whose presence has been verified during the prior 2 months as part of a statistical sample or handling during routine production need not be reverified for physical inventory. Items whose presence has not been verified in the same time interval should be located by two-person inventory teams.

Whenever an item monitoring test results in an MC&A alarm, a 5FKG (or greater) loss should be assumed until shown otherwise — either by additional (i.e., extra) item monitoring tests or by a physical inventory. See section 3.1, "Intent and Scope", for the definition of an item monitoring alarm. When verifying n randomly selected items for an item test, if one or more defective and/or missing items are encountered, an additional group of randomly selected items from the same stratum should be tested. In this additional test, the sample size should be twice as large (i.e., equal to 2n), and should not include any defective items from the initial test. Other strata scheduled for testing on the same date as the stratum giving rise to the alarm should also be subjected to additional testing (by using a 2n sample size instead of the normal size of n items). If the quantity of missing SSNM associated with the initial alarm is substantially less than 5 FKG and no further alarms result from the additional tests, strong evidence will have been obtained that a 5 FKG loss did not occur. If, on the other hand, one or more additional alarms are encountered, a complete physical inventory of all SSNM items should be immediately initiated. [Also see last paragraph of Section 3.1.4, pages 46 and 47.]

3.0 ALARM RESOLUTION

3.1 Alarm Resolution [§ 74.57(b), (d), (e), and (f)(1)]

Requirement

The rule requires that a licensee resolve the nature and cause of any MC&A alarm within an approved time period, or if not resolved within the approved time period, the licensee must notify the NRC that the alarm in question remained unresolved beyond the time period specified for its resolution. Such notification must occur within 24 hours following the expiration of the resolution period, except when a holiday or weekend intervenes, in which case the notification must occur on the next NRC scheduled workday. If a loss has occurred, the licensee is to determine the amount of SSNM lost and, as appropriate, return out-of-place SSNM to an appropriate place, update and correct involved records, and modify the MC&A system to prevent similar occurrences in the future. Additionally, if a process monitoring abrupt loss detection estimate exceeds 5 FKG of SSNM, material processing operations related to the alarm are to be suspended until completion of planned resolution activities unless the suspension of operations will negatively affect the ability to resolve the alarm. However, operations of continuous processes may continue for a 24-hour period while checks are made for mistakes.

Intent and Scope

The intent of these requirements is that the licensee's alarm resolution system must be able to respond promptly to alarms indicating a potential loss of SSNM and determine whether the alarm was caused by an actual loss or by a system error. The alarm resolution program also should be able to identify the type of system error or innocent cause so that remedial action can be taken. The alarm response should be timely to ensure that alarms are investigated and resolved promptly while memories of events leading up to the alarm are still fresh, materials are still available for remeasurement, and fewer changes of process conditions, inventories, in-process holdup, and item locations will have occurred. Prompt resolution will facilitate recovery of "lost" or stolen material.

For process monitoring, an MC&A alarm is defined as any material control test result that exceeds a defined alarm threshold value (such as that given on page 8 (Section 1.1.2) of this NUREG document. For item monitoring, an MC&A alarm exist whenever an item monitoring test results in (1) one or more item discrepancies (i.e., items not in their designated locations) which are not resolved within 8 hours for IA items, and 24 hours for IB items; or (2) one or more items being found defective (i.e., with some or all of their SSNM contents missing).

3.1.1 Alarm Resolution Procedures

Describe the alarm resolution procedures that will be applied to the various types of alarms and unit processes. The procedures should take into account credible innocent occurrences that may cause alarms indicating a potential SSNM loss. The resolution procedure descriptions may be abbreviated.

Also describe in the Plan the specific procedures to be employed in response to alarms indicating a potential loss in excess of 5 FKG. The description should identify those operations that will be shut down or alternative measures that will be employed in lieu of shutdown to facilitate an investigation.

In the Annex, provide:

- A listing of identified credible causes of possible alarms by unit process and details of the resolution procedures by which specific causes could be identified,
- A statistical estimate of the expected number of unresolvable alarms per inventory period with loss estimates greater than 5 FKG and a description of the estimation method, and
- The justification for not shutting down certain process operations during an investigation.

Affirmations: Written investigation procedures are maintained that include decision rules by which a particular cause or combination of causes will be accepted as the cause of an alarm.

Acceptance Criteria: Resolution procedures are described for alarms that indicate a potential abrupt loss of 5 FKG of SSNM in bulk or item form. The procedures take into account the expected differences in loss mechanisms and necessary differences in response approaches for in-process materials, items, different material types, and different types of unit operations. The differences and variations in resolution procedures are explained. Examples of different types of unit processes are:

- A bulk storage unit,
- A batch process with cleanout between batches and very small amounts of in-process holdup,
- A continuous process with continuous flow between the unit process and the succeeding process, and
- A process with large hold-up inventories that cannot be measured directly without cleanout.

The alarm resolution procedures provide a systematic and logical sequence of steps for determining the cause or causes of an alarm. An example of a systematic approach to assessment would be:

- Check the data and calculations for clerical, transcription, or computational errors,
- Trace the data to the primary sources (operator logbooks or production records and analytical reports) to check for agreement,
- Compare the source data, such as item and batch sizes and numbers, inventory quantities and flow rates, to historical values to detect anomalies that may indicate an error of identification or measurement,
- Review downstream material balances for potential off-setting gains,
- Localize the source of the alarm as nearly as possible with regard to time, place, material type, and individuals potentially involved,
- Report a potential SSNM loss to security who then should implement intensified search and surveillance procedures,
- Stop further processing in the unit process, if feasible, to retain items and inventory for remeasurement, and
- Remeasure all items, inventories, batches, and/or samples from the unit process that are still available.

Questions and Answers:

Q How do alarm resolution requirements [§74.57] integrate the contingency plans for MC&A events required in 10 CFR Part 73?

A Licensees' plans for response to MC&A indications of possible theft or missing SSNM are currently part of the licensees' "Safeguards Contingency Plans," required by 10 CFR 70.22(g)(2), 73.20(c), and 73.46(h). These were prepared in accordance with the criteria in Appendix C to 10 CFR Part 73 and Regulatory Guide 5.55, "Standard Format and Content of Safeguards Contingency Plans for Fuel Cycle Facilities." However, the regulations under which those plans were prepared and reviewed focused on the physical security system. The reform amendments define the performance to be achieved by the licensees in response to detection alarms from the MC&A system and to external allegations of thefts. Furthermore, the reform amendments require reconsideration

by the licensee of what constitutes an MC&A detection, with increased attention paid to process and production anomalies that might be due to SSNM loss, and less emphasis on periodic physical inventories. Thus the licensees would have to periodically revise their FNMC plans to comply with the reform amendments, as well as reconsider the parts of their Safeguards Contingency Plans dealing with MC&A events. Rather than duplicate the same words in both plans, either plan could incorporate by reference appropriate pages of the other.

3.1.2 Decision Rules

Describe the types of information and data developed during response that will be accepted as sufficient evidence for assigning a specific cause to an alarm. The information and data described above should form the basis for development of the decision rules to be included in this section. These rules should take into account every identified potential innocent cause that may result in a bulk or item loss alarm.

Affirmations:

A systematic investigation into the nature and cause of each MC&A alarm will continue until the cause has been established or a determination has been made that the alarm is not resolvable with the information currently available. NRC will be notified when the latter situation occurs within 24 hours or within the next working day when a weekend or holiday intervenes.

Investigation of alarms is initiated promptly, and the maximum allowable time periods for completion of the alarm resolution procedures are specified in Section 3.1.1 (*Alarm Resolution Procedures*).

A search for a missing item continues until the item is either located or evidence is obtained that the item has been destroyed. A claim that an item containing more than 50 formula grams was destroyed without having been recorded is supported by independent and concrete confirmatory evidence of destruction.

Following alarm resolution, appropriate corrective action is taken to correct any records in error, to return misplaced SSNM to the proper location, if appropriate, and to revise the MC&A system to prevent similar occurrences in the future if such action is warranted.

When an actual loss of SSNM is indicated, the quantity of material lost is estimated and other information that may aid in the recovery of the material, such as the material type and container type and who last had responsibility for it, is generated, if possible.

When a detection alarm indicates a potential loss in excess of 5 FKG, continuous processing operations related to the alarm is suspended within 24 hours after the alarm, and the suspension is continued until completion of the planned resolution activities unless the suspension would negatively affect the ability to resolve the alarm,

or

When a detection alarm indicates a potential loss in excess of 5 FKG, batch processing operations are suspended immediately after the alarm or upon completion of the batch in process, and the suspension is continued until completion of the planned resolution activities.

When a process is not shut down, equally effective alternative measures are taken when an alarm occurs, to protect information and material that would be needed during the alarm investigation. Alternative measures by unit process are documented in the procedures specified in Section 3.1.1 (*Alarm Resolution Procedures*).

Acceptance Criteria: Each type of alarm response is identified with the corresponding types of material and/or unit processes and the credible innocent causes of the alarm. Examples of innocent causes would be:

- A clerical or computational error is identified that clearly explains the alarm,
- A missing item is located,
- A claim that an item was added to the process, although no record of the transfer exists, if substantiated through an actual yield versus predicted yield comparison,
- A remeasurement confirms that error(s) in the original data caused the alarm, or
- A random fluctuation in the measurement process or a process variability is identified through sufficient measurements or additional processing.

The decision rules for a conclusion that a particular cause is applicable and that the alarm is resolved are described. (Backup information about the rationale and justifications are included in the Annex.) A decision rule must generally provide an objective basis for deciding whether or not the data and information acquired up to that point in the alarm assessment supports the hypothesis that the alarm was due to an innocent cause. Each decision rule should be based on the identification of a specific

cause or a source of incorrect data that contributed to the alarm level of the loss estimator except that the rule may verify with high probability that no loss has occurred without having identified all contributing causes of the alarm. Examples of acceptable decision rules are:

- A false alarm resulting from a mistake.

  1) A correctable mistake identified and supported by direct evidence such as comparison to data collection sheets, reading a column level, or measuring a sample.

  2) A correctable mistake or recordkeeping error identified and supported by at least two sources of independent indirect evidence such as consistency of process values, historical ranges, a loss followed by a gain in the following control unit such that an error in the transfer was identified as greater than measurement error, or an interview with operators who observed an unusual process condition.

  3) A hypothesized uncorrectable mistake (or combination of mistakes) or procedural error which is supported by a difference of opposite sign and comparable magnitude in a related loss indicator and two sources of indirect evidence such as process yield, balance around non-SSNM materials, process consistency, or measurement control data indicating a short-term failure.

- A false alarm caused by stochastic fluctuations in the detection system.

  1) An error resulting from measurement variability identified and supported by remeasuring inventories or transfers where the differences between the original and remeasurement values exceed the 2-sigma confidence interval used to monitor and control measurement performance.

  2) An error resulting from variabilities in the process that is confirmed by processing the material through the process and verifying the discrepancy by recovering the material.

  3) An error resulting from inadequate modeling of in-process inventory where continued processing results in a stable cumulative loss indicator.

  4) A bias identified by an independent technique that results from differences in material types being processed.

Remeasurements of the SSNM to verify the content or composition of items or bulk material associated with an alarm are made to a standard deviation of the quantity estimate that is comparable to that of the book value, and the hypothesis that the difference between the initial and remeasurement value is zero is tested at the 0.05 level of significance.

After an alarm has been resolved, the planned corrective action includes MC&A system revisions, if appropriate, that provide reasonable assurance that future alarms of that nature (i.e., having the same or a similar cause) will not occur. An example of where an MC&A system revision would be appropriate would be revision of a procedure or computer software that contains an error that caused an alarm.

The operations that will be shut down to resolve alarms indicating a possible loss in excess of 5 FKG are identified or alternatives to shutdown are provided. [Refer to pages 8 and 9 for establishing alarm threshold values indicative of a possible 5 FKG loss.] Examples of acceptable alternatives might include:

- Shutting down of only downstream operations to retain products that may require remeasurement,
- Discontinuing the processing of certain sidestreams to retain scrap or recyclable intermediates that may require remeasurement,
- Diverting scrap, waste, or product from the alarming unit to auxiliary vessels or to a buffer storage area to retain the products for remeasurement,
- Collecting additional samples for remeasurement of materials that would become unavailable if operations were not suspended in the area under investigation.
- The key consideration in employing alternatives to shutdown is that the licensee can show that no data or information needed for response will be lost if the alternative is used.

The conditions for restart are specified. Fundamental to any decision to restart is whether the alarm has been resolved (i.e., an assignable cause has been identified), the loss is real but remedial, recovery action is underway, or the alarm has not been resolved. Prior to restart, the licensee must verify that all possible data associated with the process material have been acquired, and no information will be jeopardized by resuming operations.

The quality of the licensee's loss resolution capability is such that the combination of the material control test and resolution decisions permit alarms remaining unresolved after investigation to be good indicators of material loss. To achieve this objective, the licensee's planning data should demonstrate that the expected number of unresolved alarms in excess of 5 FKG are less than 0.10 abrupt loss alarms per inventory period.

The following additional information is pertinent to this point:

The only false alarms that need to be predicted are those due to normal process or measurement system statistical variation. Mistakes in transcription of data or process upsets do not need to be predicted because the response procedures should be designed to correctly resolve alarms stemming from those types of events. False alarms due to statistical fluctuations are expected to be more difficult to resolve.

One approach is to claim no credit for resolution of statistical alarms. Then the incremental expected number of alarms with discrepancies greater than 5 FKG can be calculated for a single test from the formula:

$$\Delta N = 1 - F(5/\sigma)$$

where

σ = the predicted standard deviation of the detection test in FKG

$F(x)$ = the predicted statistical distribution of the test statistic normalized by σ.

This increment must then be multiplied by the expected number of times the test will be performed in an inventory period, and similar calculations then added up over all tests in the facility. That sum must be less than 0.10 (i.e., the number of such alarms would be less than one in 60 months, assuming a physical inventory frequency of every six months).

If the distribution function cannot be assumed to the normal (Gaussian) and the true distribution cannot be adequately predicted, the Camp-Meidell inequality may be applied if it is reasonable to expect the true distribution will be symmetric and unimodal (see Shewhart 1931, pages 176-177; and Eisenhart, Hastay and Wallis 1947, page 49). The Camp-Meidell inequality permits a bound on N to be calculated from the formula:

$$\Delta N \leq \left(\frac{8}{9}\right)\left(\frac{\sigma}{10}\right)^2$$

where σ has units of formula kilograms. However, this will typically be useful only if σ is less than 0.1 FKG. A more useful approach would be to estimate the maximum range that the test statistic could be based on a physical model of the process and measurement systems under the hypothesis of no material diversion. If this value is less than 5 FKG, set $\Delta N = 0$.

Evaluation is more complicated if the licensee claims that response procedures will permit resolution of some fraction of the statistical false alarms. Such procedures would need to be summarized in the plan. One approach is to make additional measurements of inputs, products, sidestreams, and holdups to complete measured material balances where loss detectors are based on average expected yields. Additional measurement of input quantities requires samples to be taken and retained. This would permit laboratory analyses to be made which are more reliable than NDA. The procedures also could utilize data resulting from processing the same batch through the next process step, data resulting from processing another batch through the same process step, and tests that eliminate intermediate measurement points by combining several process steps. In any of these, estimating the fraction of N that would be expected to remain unresolved requires detailed modeling of the response capability.

A Monte Carlo simulation method can be used to model the alarm response procedures and predict the resolution success rate. For a single material control test, refer to Tanner (1981). For an entire plant, refer to Reardon, Heaberlin and Eggers (1982). Detailed information is available in Eggers (1982).

Alternatively, if the licensee has a performance history of responses to and assessment of alarms, this may be cited in-place of the simulation of a proposed response program if the experience demonstrates a capability to meet the commitment goals for resolving false alarms.

Questions and Answers:

Q What quality of loss resolution must the licensee achieve?

A The combined quality of the material control test and loss resolution decisions shall permit alarms remaining unresolved after completion of the licensee's investigative activities to be good indicators of theft or diversion. This will be judged in two ways:

1) During review of a licensee's planned detection and alarm resolution capabilities, attention will be directed to the ability to resolve false abrupt loss alarms. For the alarm resolution capability to be acceptable, it must appear able

to correctly identify all errors due to leaks, process upsets, or human mistakes that are large enough to cause an alarm. With respect to other false alarms, in particular those alarms that are expected to occur because of the statistical nature of the processes and measurement systems, the alarm resolution capability need not be 100% effective. However, for it to be acceptable, it must be effective enough to satisfactorily limit the statistically expected rate of unresolvable abrupt loss alarms. (The expected rate can be thought of as a weighted average of all possible rates, where the weights are the likelihoods of occurrence of those rates.) A satisfactory limit is an expected rate of unresolvable large abrupt loss alarms less than one per 10 years per plant. A large false alarm is one whose loss estimate exceeds 5 FKG. Because the licensee should be able to resolve all such alarms other than those of a statistical nature, calculation of the expected rate of unresolvable large abrupt loss false alarms needs only consider false alarms of a statistical nature.

2) After the phase-in period is over and all elements of the licensee's alarm resolution commitments have been implemented, the alarm resolution performance would be judged good when: (a) there have been no situations over the past year in which subsequent audits or investigations determined that a large abrupt loss alarm was innocently caused but not resolved within the licensee's time commitments; and (b) there are no unresolved large abrupt loss alarms remaining after the bi-monthly inventories and annual audit have been completed.

3.1.3 Response Time

Indicate the response times that will be allotted to resolve each alarm type. If alarms involving certain material types or alarms from certain processes require appreciably longer response times than those estimated in the acceptance criteria section below, justify the indicated times.

Affirmations:

Loss detection alarms will be resolved as promptly as practical given the process complexity.

Acceptance Criteria:

The alarm resolution time commitments ensure a reasonably prompt alarm response. The check of the loss indicator data for clerical mistakes and data errors should normally be completed within 24 hours for any abrupt loss alarm. The maximum time for completion of the resolution procedure for alarms indicating a possible abrupt loss of items that were tamper-safed, encapsulated, or retained in a vault that provided protection equivalent to tamper-safing should normally not exceed 3 calendar

days. The maximum time for completion of the resolution procedure for alarms indicating a possible abrupt, loss of SSNM in any form or container that was not tamper-safed, encapsulated, or stored in a vault equivalent to tamper-safing should not normally exceed 3 working days. However, if longer time periods are required for certain unit processes or types of necessary response activities, the licensee should explain and justify the proposed times in its submitted FNMC plan.

When a tamper-safed or encapsulated item has been compromised, a remeasurement must be undertaken immediately. The maximum time after the alarm for completing a remeasurement to confirm the contents should normally not exceed 2 working days. Any proposed extension of that time should be explained and justified. An example of where additional time might be necessary would be if isotopic measurements are performed off-site.

When a vault or CAA providing protection equivalent to tamper-safing has been entered without authorization, when the prescribed vault protection has been compromised, or when other indications of loss of control are discovered, the entire vault contents must be accounted for within 3 calendar days by a piece count and attribute test of all items not tamper-safed or encapsulated, such as by weighing or NDA. Remeasurement of all items in the vault or CAA not tamper-safed or encapsulated should be initiated within 1 working day. If a longer period is proposed, justification is provided.

3.1.4 Item Discrepancies

Describe the actions that will be taken in response to the following item discrepancies:

- An item has apparently been destroyed without being recorded.
- The integrity of a tamper-safed or encapsulated item has been compromised.
- Unauthorized entry or other violation of control of a vault or a permanently CAA has occurred.
- A statistically significant difference between the measured input and output value of an untamper-safed item placed in vault or CAA storage has been detected, and such difference exceeds 25 grams SSNM.

The actions in response to these discrepancies should include decision rules which will be the basis of acceptable resolution.

Affirmations: If the integrity of an item has been compromised (i.e., the container seal or the encapsulation has been altered or broken) an appropriate response procedure is promptly initiated to determine whether any SSNM is missing.

Compromised items are placed under surveillance or in secure storage and are remeasured within specified time periods. The quality of the remeasurement is at least equal to that of the original measurement.

Acceptance Criteria: An item loss assessment procedure has been included that details a logical sequence of actions to resolve an apparent loss. A typical assessment sequence (not necessarily in the order listed) might be to:

- Determine that the records are apparently correct by tracing the item identification and location information to its source data in inventory and production records;
- Search other production and storage areas to determine if the item was transferred without supporting documentation;
- Identify all persons involved in creation and movement of the item(s) and question them for possible ways the item might have been misplaced or record errors made;
- Extend the search to other locations, particularly those suggested by the persons involved;
- Check for possible errors in the item records by evaluating the bulk material balances in the adjacent processing units;
- Reinventory all items of that type in storage locations routinely used for such items; and
- Extend the inventory search to items of similar size and appearance.

A description of the licensee's proposed course of action in response to broken tamper-seal should include:

- Placing the item under surveillance immediately or in secured storage and remeasuring it as soon as practicable (time limits specified) to determine if SSNM is missing,
- Performing blending, mixing, or splitting operations, if appropriate, to ensure that any samples taken for remeasurement are representative; and

- Comparing (testing) the difference between the original and confirmation measurement for statistical significance with a probability of no more than 5% of concluding that no SSNM is missing when in fact a loss has occurred. The quality of the remeasurement should be at least equivalent to the original measurement.

If the cause of the alarm is claimed to be the destruction of an item such as by processing it to another form, without the act having been recorded, confirmatory evidence must be developed to support the conclusion. The types of confirmatory evidence that are expected to be applicable are described in the plan. The evidence will be acceptable if it is relevant, concrete, independent, and objective. Examples of such evidence are:

- The measured density of a suspect solution is consistent with the predicted density assuming the contents of the missing container had been added to the process,

- The actual yield from a suspect unit process is consistent with the predicted yield from that process if it contained the contents of the missing item, or

- The fact that the container was added to process can be attested to by two individuals.

If an item is discovered as not being in its recorded location, such an event should be designated as an *item discrepancy* (with the time of such discovery being documented). If an item discrepancy is not resolved within 8 hours for IA items, and within 24 hours for IB items, an alarm is declared. The licensee normally declares such an item as *missing* if not found or accounted for within: 24 hours for Category IA items and 3 working days for all other items (relative to time that item discrepancy was discovered). A search for a misplaced item that was not tamper-safed or encapsulated may not be terminated without NRC permission until the item is located or evidence of its destruction is obtained. A claim that an item was destroyed without recording the fact may be accepted if independent confirmatory evidence of destruction is obtained. Items containing less than 0.05 FKG are exempted from the requirements for confirmatory evidence. Searches for declared missing items may not be interrupted by idle time such as weekends and holidays.

If an item is discovered as being compromised and more than 25 grams of SSNM is missing from the item, an MC&A alarm should be immediately declared.
Whenever an item monitoring test results in an MC&A alarm, a 5

FKG (or greater) loss should be assumed until shown otherwise, either by additional (i.e., extra) item monitoring tests or by a physical inventory. If, when verifying n randomly selected items for an item test, one or more defects are encountered and the quantity of missing SSNM associated with the compromised or missing items is substantially less than 5 FKG, an immediate additional group of randomly selected items from the same statum should be tested. In this additional test, the sample size should be twice as large (i.e., equal to 2n), and should not include any of the defective items from the initial test. If no alarm results upon performing the additional 2n test, strong evidence will have been obtained that a 5 FKG loss from the stratum in question did not occur. Depending on the circumstances, additional item tests on other strata may be necessary in order to resolve an item alarm. If the quantity of missing SSNM associated with the initial alarm is 4.000 or more (i.e., not substantially less than 5 FKG), a physical inventory of all items on hand should be immediately initiated. [Also see last paragraph of Section 2.1.8, page 33.]

3.2 Alarm Reporting [§74.57(c) and (f)(2)]

Requirement — The rule requires that a licensee notify the appropriate NRC safeguards licensing organization within the Office of Nuclear Materrial Safety and Safeguards of any MC&A alarm that remains unresolved beyond the time period specified for its resolution. Notification is to occur within 24 hours following the deadline for resolution, or by the next working day when a weekend or holiday intervene. For alarm estimates that exceed 5 FKG, the notification that an MC&A alarm resolution procedure has been initiated is to occur within 24 hours of the alarm occurance.

Intent and Scope — The intent of these requirements is that the NRC be made aware of potential SSNM losses in a timely manner so that appropriate actions can be initiated.

3.2.1 Reporting Responsibility

Indicate how the responsibility for reporting unresolved alarms will be assigned in the organization.

Affirmations:

The appropriate NRC Office will be notified within 24 hours, or by the next workday when a weekend or holiday intervene, of any alarm that remains unresolved beyond the time limit specified for its resolution in Section 3.1.3 (*Response Time*).

The appropriate NRC Office will be notified within 24 hours of the initiation of an alarm resolution procedure involving an alarm estimate that exceeds 5 FKG.

Acceptance Criteria: The responsibility for reporting unresolved alarms is assigned at a sufficiently high level of responsibility within the licensee's organization that decisions on the need for reporting will be timely and unquestioned.

With regard to recurring losses, a significant loss trend is reported to the NRC within 1 week of its discovery and the progress of the resulting investigation is reported monthly.

3.2.2 Information Discuss the types of information that will be provided to NRC and the schedule for updating the status of the unresolved alarms to NRC.

Affirmations: The NRC Office will be provided with current, technically defensible information on the status of alarm resolution activities based on a mutually agreed upon schedule.

Acceptance Criteria: The information to be reported includes: the magnitude of the discrepancy indicated by the alarm, the investigation procedure, the status of the investigation, the status of the facility, the planned remedial measures, and the status of the physical security system during the period.

The remedial measures include assignment of responsibility for the investigation to a technically competent individual, rechecking the response of the measurement system with certified standards, outlining a schedule of recalibrations of the key measurement systems if appropriate, in-situ or cleanout measurements of holdup, and statistical evaluation of the material accounting data.

3.3 Alleged Thefts [§74.57(e)]

Requirement The rule requires that a licensee establish and maintain ability to respond rapidly to alleged thefts.

Intent and Scope The intent of this requirement is to have an established capability to respond rapidly to alarms occurring external to the MC&A system. The response capability should provide the information necessary to rapidly assess the validity of an alleged theft.

3.3.1 Response Capabilities Describe the item control system that will be maintained in order to readily determine the identity, quantity, and location of SSNM in item form. The description should include the forms, records, and document flow paths. Where records are not centralized, the means of record verification by MC&A personnel and the responsibility for maintenance and disposition should be described.

Describe the emergency physical inventory procedure, including a description of the status that each unit operation should be in to be inventoried and indicate the status of each unit operation during its inventory.

In the Annex provide estimates of the times needed to perform and reconcile the inventory and to determine the associated projected variance.

Affirmations: An allegation or other indication of diversion of SSNM from its authorized location will be rapidly investigated and evidence developed that supports either a confirmation or a denial.

A contingency capability is maintained to locate on demand any specific tamper-safed or encapsulated item or an unencapsulated item stored in a vault equivalent to tamper-safing within 8 hours, and to verify the presence of all items in a vault within 72 hours.

A contingency capability is maintained to initiate an emergency physical inventory of all SSNM in the plant, or in any portion of the plant, within 24 hours after receipt of an NRC order. ("Initiate" means to begin actions to place SSNM in a measurable form and perform necessary preparations for conducting a physical inventory.)

Acceptance Criteria: From the description of the SSNM item record system, it is evident that the records of the identity and location of every item can be updated with sufficient speed to support the commitments that any randomly selected item within a vault can be located within 8 hours, and any item outside a vault can be located within 24 hours. The capability also exists to locate all items within a vault within 72 hours and all items outside a vault or permanently CAA within 1 week.

Provisions are included 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. The emergency inventory capability is designed to help answer the following questions:

- Can it be determined conclusively that SSNM is or is not missing from the facility?
- What quantity is missing?
- What material type is it? For example, what is its isotopic composition, its chemical form, and its physical size?
- Over what time period could it have been diverted?

- Which plant employees or other individuals might have had access to it during that time?
- Which plant employees may be able to provide information useful for its recovery?

3.3.2 Record Maintenance

Describe the protective measures that will be implemented to prevent loss, misplacement, or accidental destruction of inventory and item location records. (Reference Section 4.6.2 *Record Maintenance*.)

Affirmations:

Accurate item inventory records are established and maintained to provide knowledge of the identity, location, and quantity of SSNM in the form of items outside a vault or CAA, and the capability is maintained to update the records rapidly enough to confirm the presence and integrity of any item within 24 hours and, upon demand, all items within 1 week.

For material not in the form of items, accurate records are established and maintained on the quantities of SSNM which have been received, shipped, or otherwise removed from each MAA, and quantities of SSNM remaining within each MAA. The capability will be maintained to update the records rapidly enough to meet the requirements for an emergency plant-wide physical inventory.

Acceptance Criteria:

Appropriate safeguards are implemented to prevent loss, misplacement, or accidental destruction of the inventory and item location records.

The data collecting, recording, and auditing procedures provide reasonable protection against errors in the records.

Questions and Answers:

Q What are alleged thefts? [§74.57(e)]

A Alarms that originate external to the MC&A system. Among these are any statements communicated directly or indirectly to facility staff, NRC, FBI, police, etc., that diversion of SSNM under license has occurred. The statements may or may not include details such as the plant area from which SSNM was allegedly taken, which item(s) was (were) taken, a description of the container(s) or material allegedly taken, or other information in support of the allegation. This covers threats allegedly from within as well as from outside the facility. An external alarm may include other indications such as an external assault that penetrated an MAA or the discovery that an MAA door had been opened from the inside.