

LA-UR 94-3207

Conf-940743-97

Los Alamos National Laboratory is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36

TITLE: NEW DEPARTMENT OF ENERGY POLICY AND GUIDANCE FOR COST-EFFECTIVENESS IN NUCLEAR MATERIALS CONTROL AND ACCOUNTING PROGRAMS

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SUBMITTED TO: 35th Annual Meeting of the Institute of Nuclear Materials Management, Naples, Florida, July 17-20, 1994

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FORM NO 836 R4
SI NO 2629 5-81

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**NEW DEPARTMENT OF ENERGY POLICY AND GUIDANCE
FOR COST-EFFECTIVENESS IN
NUCLEAR MATERIALS CONTROL AND ACCOUNTABILITY PROGRAMS**

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ABSTRACT

Recent Department of Energy (DOE) initiatives have given Departmental nuclear facilities the opportunity to take more credit for certain existing safeguards and security systems in determining operational program protection requirements. New policies and guidance are coupled with these initiatives to enhance systems performance in a cost-effective and efficient manner as well as to reduce operational costs. The application of these methods and technologies support safety, the reduction of personnel radiation exposure, emergency planning, and inspections by international teams. This discussion will review guidance and policies that support advanced systems and programs to decrease lifetime operational costs without increasing risk.

I. Introduction

Recent DOE guidance has sought its to promote an increase in efficiency and a decrease in operational and construction costs associated with the control and accounting of nuclear materials. This guidance has included topics associated with nondestructive assay (NDA) measurements, reporting requirements for very small quantities of nuclear materials, extending the time between nuclear materials inventories, nuclear

materials access requirements, and facilitation of waivers and variances. Application of these new criteria is leading to new methods to promote the protection strategies of the department without a change in associated risks. Aspects of this guidance are being incorporated into the revised order on materials control and accountability (1).

The Department realizes the importance of balancing risk of diversion, theft, or sabotage with the costs associated with the safeguarding of nuclear materials. Development of new technology supported by the Office of Safeguards and Security provides a means to reduce the impact on facility operations and associated costs without increasing unacceptable risks. With the end of the Cold War and increased emphasis on environmental restoration, questions are being raised in regard to the mission of many Departmental facilities and the cost of providing safeguards and security under federal government requirements. Redefining safeguards requires a change in policies, practices, and procedures to address the threat guidance. Safeguards will require advanced ways of balancing costs against acceptable vulnerabilities. The Department's objective in issuing new guidance is to initiate this improved safeguards and modify it as new technology and methods are developed and proven for application. These new directions

also consider credit that can be taken for existing safeguards procedures and practices at DOE facilities in controlling risk and assuring nuclear material inventories.

This paper will highlight recent materials control and accountability guidance issued by the Department.

II. Reducing Nuclear Materials Physical Inventory Requirements

The approach to reducing physical inventory requirements incorporates materials measurement, control and detection systems, and takes into account physical protection and personnel access control features without compromising essential Departmental nuclear materials goals. The guidance pulls in performance measures to provide assurance that the associated risks are adequately addressed. However, this guidance is directed towards long term storage facilities and not interim vaults or those with routine worker access or materials addition/removal. It is possible to receive credit for modularized storage vaults where materials in long term storage can be separated in special protected modules with the interim or working vault.

The alternative measures addressed by this guidance (2) can be incorporated into a materials accountability and control program. Additional protection methods and techniques are addressed that are beyond those considered as baseline requirements to meet the minimum intent of the DOE 5630 Series Orders. These additional categories are identified as:

1. Any system that would further limit or inhibit access to the storage area or removal of nuclear

materials stored in inventory;

2. Monitoring aspects that would increase detection of unauthorized access by personnel or equipment and/or movement in the storage area; and

3. Individual method and techniques which provide qualitative or quantitative assurance that no changes have occurred in the stored materials.

Alternative measures beyond those for a basic safeguards program can be incorporated to provide increased assurance that the materials inventory has not changed.

These include area/environment, location/containment, and continuously-monitored item/material attributes. All of these can be individually used to increase the duration between inventories from 6 months up to 3 years, depending upon the frequency of storage access. Multiple attributes in the same category can be used but will receive decreasing credit; no additional credit may be considered for attributes having common failure modes. Only attributes whose failure does not degrade the effectiveness and performance of another attribute can be considered for credit. Of course, all attributes, methods, and technology must meet minimum Departmental performance and design criteria.

Additional guidance was issued later in 1993 (3) to include automated control and monitoring technologies that are tamper-indicating as alternative means to extend periodic inventory frequencies. This document suggests useful technologies for automated physical inventories and describes the extent to which they can reduce physical inventory frequencies. Methods that can be used to perform an automated physical inventory to verify the presence of items and perform confirmation measurements on

the items. Generally, for an inventory to be described as an automated physical inventory, it must require use electronic monitoring on a cycle less than the minimum time necessary to alter the location, identification, or nuclear material content of the item(s) in storage. For example, total credit for the use of multiple measures suggested in these documents can be determined through the following algorithm:

$$\begin{aligned} \text{Total Credit} &= A + B + C \\ &= (a_1 + 0.5*a_2 + 0.25*a_3 + \dots) + \\ & (b_1 + 0.5*b_2 + 0.25*b_3 + \dots) + (c_1 + \\ & 0.5*c_2 + 0.25*c_3 + \dots) \end{aligned}$$

Where A, B, and C represent the general categories of alternative measures identified in these documents and a₁, b₁, etc. represent any individual alternative measure within the associated category.

These two guidance documents provide program offices and safeguards and security organizations with a basis to evaluate and take credit for a complete range of protection measures as already incorporated at their facility. They also provide a basis for requesting additional funds for upgrading aging systems with more effective and efficient new systems. In addition, reducing vault access also supports worker radiation exposure reduction and decreases the risk associated with personnel accessing the nuclear materials. Operational costs should also decrease as the number of physical inventories, associated confirmation and verification measurements, item identity checks, and supporting documentation required will be reduced.

III. Access Authorizations For SNM Categories

Departmental and contractor personnel who require access to

special nuclear materials (SNM) must be authorized as detailed in current DOE policy. The Office of Safeguards and Security has recommended new minimum levels of access authorization (4) for the four categories of SNM which includes access to materials in process and storage as well as intra- and inter-facility transfers. These new authorization levels also reflect considerations for insider risk associated with access to the materials. Recommended security clearance levels for access authorizations are:

<u>SNM Category</u>	<u>Minimum Access Authorization</u>
I	Q
II	L
III	L or Secret
IV	none

The facility Site Safeguards and Security Plan or the Master Safeguards and Security Plan may require a higher security level for access authorization to the nuclear materials. Other measures such as the Personnel Security Assurance Program may be implemented and higher levels of authorization may be mandated with vulnerability, safety, hazards, and other assessments have identified that such requirements may help mitigate sabotage or reduce risk.

These recommendations are being incorporated into the new order covering the departmental personnel security program. This guidance ties access authorizations with SNM Categories to facilitate access control appropriate to the level of risk anticipated.

IV. Nuclear Material Asterisk Quantity Reporting

The Office of Safeguards and Security conducted an in-depth study

of documentation requirements for small quantities of nuclear materials. The levels investigated were between 0.05 and 0.49 reporting units as stated in DOE 5633.3A, which requires that such levels be reported as asterisk quantities on the nuclear material inventory and transaction forms, DOE F 741/741A (5) and DP-733/733A (6).

According to this study (7), there is no significant impact in safeguards, materials management, or financial accounting requirements from no longer reporting asterisk quantities of nuclear material on inventory and transaction forms). Any reporting requirements as specified in DOE 5633.4 (8) are eliminated as of the date of the original memorandum. However, in cases where an element weight is a reportable quantity while the isotope weight is beneath a reportable quantity, the existing asterisk quantity reporting documentation requirements remain in effect. Documentation to support an item as an asterisk quantity must be maintained to support the designation. Other records at facilities will continue to provide the needed documentation and quantitative information for asterisk quantities since such small quantities may result in a reportable quantity.

The Nuclear Materials Management and Safeguards System (NMMSS) has been modified and related Departmental requirements have been changed in the order revision (1). This reporting change has been approved for all Departmental facilities subject to the related reporting requirements. The benefits from this reporting change should result in decreased data handling and NMMSS data consolidation and entry.

V. Deviations Policy

The Office of Safeguards and Security recently modified its process for approving and implementing waivers and variances (9) previously forwarded to Headquarters for review and approval. The Safeguards and Security Process Improvement/Protection Program Management Team had recommended that the operations offices be empowered to approve variances and waivers, with proper notification to Headquarters and after consideration of any Headquarters comments. This recommendation will be implemented and formally incorporated into the revision of DOE Order 5630.11A, "Safeguards and Security Program."

The empowerment will include only variations and waivers in this policy. Variations to stated protection requirements are permitted when equivalent protection measures are implemented at no additional risk. Waivers to stated protection requirements are permitted when there are compensatory measures in place to provide equivalent protection measures with no additional risk. Approval of the equivalent measures for both cases will be by the cognizant Operations Office; however, waivers require that the cognizant Operations Office notify the Office of Safeguards and Security as well as the respective program office.

Exceptions to the requirements involve using compensatory measures resulting in non-compliance with the orders such that additional risk is assumed. Assuming the additional risk requires that all exceptions be approved by the Office of Safeguards and Security to assure that the acceptance of additional risk is warranted.

This guidance will enhance and accelerate the process of approving alternate and compensatory materials control and accountability methods and techniques as in compliance with the respective DOE Orders.

VI. Traceable Nondestructive Assay Measurements

The Department has recently issued this guidance concerning the traceability of NDA measurements (10) to augment previously issued Office of Safeguards and Security guides, the "Measurement Control Guide" (11) and the "Measurement Improvement Plan" (12). These three documents were prepared and issued to provide information about measurement systems, measurement capabilities, documentation of measurement control practices, and establishing credibility for nondestructive assay measurements. The primary goal is to provide a means to meet the DOE order requirements with the greatest efficiency, defensibility, and least cost in the use of nondestructive accountability assays

In the past, measurement techniques used in accounting for nuclear materials relied heavily on destructive analysis and the ability to obtain a sample representative of the overall material to be analyzed.

These methods dominated accountability-related nuclear measurements and used standards closely duplicating the materials to be analyzed. NDA measurement received less emphasis. However, as the Department decontaminates, decommissions, and consolidates facilities, greater numbers of items are of interest which may be assayed only by NDA techniques. To facilitate the accuracy and precision of these measurements, appropriate calibration standards for these techniques must be available and used in routine analyses. These standards

and their traceability or link to a nationally accepted reference system are mandated to demonstrate the credibility and quality of the nondestructive assay results. The goal in the preparation of the NDA standards must be to ensure the standards and material to be measured are consistent in all important characteristics that may affect the measurement. These preparations must be carefully evaluated for each application and particular technology to be used in the assay process.

Working reference materials (WRMs) standardized against the certified reference materials link facility NDA measurements to the national reference system. These traceable secondary standards will duplicate the matrix, geometry, and related characteristics which affect the measurement of the materials to be analyzed. The WRMs allow the capability to develop systematic error corrections for a particular instrument and representative material assayed on that instrument. However, caution is important since there still may be other sources of error present due to differences in matrix or material origins, interfering reactions from the matrix materials, and interferences from decay products or other nuclear materials. The degree of effort employed to resolve these errors is dependent upon the relative importance as well as the associated measurement compatibility between facilities.

VII. DOE 5633.3A Revisions

As part of order consolidation activities, all four of the materials control and accountability orders are being combined into DOE 5633.3B. This involves the two NMMSS orders, DOE 5633.4 and 5633.4, as well as the general responsibilities and authorities order, DOE 5633.2A.

Although consolidation will not result in obvious cost savings, the combination will allow for easier use by the Department and its contractors.

Other proposed revisions will allow for more flexibility in performing inventories and accounting for nuclear materials. In particular, the current draft of DOE 5633.3B (1) will empower the Manager, Operations Office to determine the inventory frequency for Category III and IV materials balance area with a bimonthly interval being the minimum frequency allowed. Similarly, physical inventory requirements for Category I and II material balance areas without processing may be determined by the Manager as well with at least a biannual interval. DOE facilities will also be allowed to take credit for physical inventories performed in conjunction with International Atomic Energy Agency inspections if approved by the Manager, Operations Office.

These changes are designed to incorporate cost-effective and efficiency features to take advantage of existing facility capabilities without an increase in risk. More details concerning revisions will be provided when the final order is issued by the Department.

VII. Summary

The Office of Safeguards and Security continues to strive to remain responsive to the program needs and interests of the nuclear facilities to facilitate an overall cost-effectiveness and efficiency in all safeguards operations and facility nuclear materials handling without an unacceptable increase in the risk of diversion, theft, or sabotage. The recent policy and guidance documents briefly discussed in this paper are written to support

the changing missions of the nuclear materials complex and expand upon several initiatives identified by Departmental programs. Their application also enhances the reduction of personnel radiation exposure, emergency planning, and inspections by international teams.

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