

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.1

8-3-79

SUBJECT: CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS

1. PURPOSE. To provide material control and accountability subsystems for special nuclear materials (SNM) which will complement the physical protection subsystem outlined in other Department of Energy (DOE) orders in the 5630 series. These three subsystems comprise the DOE safeguards program to guard against the theft or unauthorized diversion of SNM.
2. CANCELLATION. IMD 6104, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS OF 9-29-77, as extended by DOE N 1321.45, of 6-26-79.
3. SCOPE. This Order applies to all Departmental elements, its contractors and subcontractors who may possess, use or ship nuclear material.
4. POLICY. Special nuclear material shall be controlled and accounted for consistent with the common defense and security of the United States. Other designated nuclear materials shall be controlled and accounted for consistent with management and health and safety objectives established by other DOE guidance. In support of this, DOE will:
 - a. Assure that material control and accountability measures for SNM are designed so as to facilitate to the extent practicable, use or integration of material control and accountability measures for SNM to serve criticality, quality control and production control programs.
 - b. Provide material control and/or accountability subsystems for other nuclear materials to facilitate management or health and safety control.
 - c. Provide inventory data on a timely and uniform basis for safeguards and management or health and safety purposes on both SNM and other nuclear material.

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- d. Assure that nuclear materials or equipment supplied to nations or persons abroad are subject to measures which will assure that they are used for agreed-upon purposes only.
- e. Facilitate the development of foreign country and International Atomic Energy Agency (IAEA) safeguards systems.

5. RESPONSIBILITIES AND AUTHORITIES

a. The Assistant Secretary for Defense Programs, through the Office of Safeguards and Security:

- (1) Develops DOE-wide policies, procedures, and standards for the safeguarding of SNM including material control and accountability of SNM and other designated nuclear materials.
- (2) Approves requests for exceptions to the provisions of this order and those in the 5630 series unless this responsibility is specifically granted to the cognizant operations office by appropriate sections of this order or others in the 5630 series.
- (3) Establishes, after coordination with Secretarial Offices and field organizations, material control and accountability policies, procedures, and standards affecting field organizations, DOE license-exempt contractors and subcontractors and assures that they are equivalent in their effectiveness to policies, procedures and standards imposed by the Nuclear Regulatory Commission (NRC).
- (4) Conducts routine periodic assessments of the DOE material control and accountability program, including (a) review of DOE staff survey reports, activities and evaluation of inventory differences, and (b) spot checks, as required, of surveys of license-exempt contractors and, in collaboration with NRC, licensees as required.
- (5) Conducts onsite safeguards and security reviews of nuclear materials distributed abroad to the extent provided for in international agreements, and participates in international discussions regarding safeguards policies and procedures with other DOE organizations involved in international programs.
- (6) Provides technical advice, analyses, and recommendations in developing international safeguards policies and procedures.

and subsequently manages programs for technical cooperation with the IAEA in its safeguards role in guarding against the diversion of nuclear materials and equipment supplied for peaceful purposes to nuclear weapons, nuclear explosive devices, or any other military purpose.

- (7) Conducts special investigations of activities of license-exempt contractors, as necessary. Coordinates these special investigations with the appropriate Headquarters program division/office and operations office(s).
- (8) In consultation with program divisions/offices initiates and directs programs for providing required technology, equipment, and procedures to improve material control and accountability and nuclear materials measurement, and to assure that government and industry are provided with chemical and isotopic reference standards, and calibration and test materials in cooperation with the National Bureau of Standards.
- (9) In connection with activities of license-exempt contractors and subcontractors, (a) recommends to the responsible authority corrective action to assure compliance with overall safeguards policies, procedures, and requirements, and (b) recommends suspension of such activities or other arrangements when necessary.
- (10) Prepares reports and provides data for reports to the Secretary on the status of the safeguards program.
- (11) Provides staff guidance and assistance with respect to policies, procedures, criteria and standards developed by the Office of Safeguards and Security.
- (12) Manages the development and maintenance of the Nuclear Materials Management and Safeguards System (NMMSS) by:
(a) collecting data relative to nuclear materials including those for which the United States has a safeguards interest both domestically and abroad; (b) processing the data; and
(c) issuing reports to support the safeguards and management needs of DOE, NRC, and other government organizations.
- (13) In connection with international agreements, (a) recommends corrective action to assure compliance with overall safeguards policies, procedures, and standards, and (b) recommends suspension of any agreements where necessary to meet DOE policy in regard to such arrangements.

(14) Audits DOE operations office records.

b. Secretarial Offices and Field Organizations:

- (1) Assure that each contractor and subcontractor under their jurisdiction who may use or possess SNM or other nuclear materials is required by contract to develop and maintain written current procedures for safeguards control and accountability of nuclear materials. Review and approve such procedures and revisions thereto prior to being put into effect, and approve exemptions from this requirement.
- (2) Assure that each contract under which nuclear materials are to be supplied to license-exempt contractors contain appropriate safeguards provisions.
- (3) Assure that inventory and scrap levels of nuclear material held by contractors and subcontractors under their jurisdiction are minimized to be consistent with good safeguards practices.
- (4) Take appropriate action to correct deficiencies disclosed during surveys.

c. Heads of field Organizations:

- (1) Implement material control and accountability of nuclear materials for all DOE activities under their jurisdiction in conformity with the policies, procedures, and requirements set forth in this Order.
- (2) Assure the maintenance of records and issuance of periodic reports reflecting nuclear materials transactions and inventories under their jurisdiction.
- (3) Implement the Nuclear Materials Management and Safeguards System for all DOE activities under their jurisdiction in conformity with the policies, procedures, and standards set forth in this Order.
- (4) Approves exceptions to the requirements of the orders in the 5630 series where specific permission to do so has been granted by DP-1.
- (5) Reviews and analyzes inventory differences experienced in operations under their jurisdiction to determine and document the probable causes.

- (6) Assures that contractors and subcontractors under their jurisdiction analyze and determine the probable cause of all inventory differences; determine the reasons for quantities reported as differences arising on nuclear materials transfers; evaluate the significance of all differences; and take such corrective action as is deemed necessary. Review and approve or direct other necessary actions by the contractor as necessary to eliminate or reduce the inventory difference.
- (7) Report inventory differences immediately to the Office of Safeguards and Security and the appropriate Headquarters Program Office.
- (8) Develop detailed procedures for the conduct and reporting of nuclear materials surveys.

FOR THE SECRETARY OF ENERGY:



William S. Heffelfinger
Director of Administration

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.2

8-21-80

SUBJECT: CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES

1. PURPOSE. This Order contains the basic principles and requirements for control and accountability of all nuclear materials. This Order, coupled with those in the Department of Energy's (DOE) 5630 series, together with physical security requirements outlined in the DOE 5632 series, comprise an overall integrated safeguards and security system for those nuclear materials meeting the definition for special nuclear material (SNM).
2. SCOPE. The provisions of this Order apply to those facilities involving nuclear operations under the management of the Assistant Secretary for Nuclear Energy, the Assistant Secretary for Resource Applications, the Director of Energy Research, and the Assistant Secretary for Defense Programs, and operations offices; and include all elements of the Department, their license-exempt contractors, and subcontractors which possess, use, or ship nuclear materials. Further, this Order applies to DOE-owned other nuclear material (e.g., deuterium, americium, curium) at licensed and unlicensed facilities when these materials are not covered by Nuclear Regulatory Commission (NRC) license.
3. BACKGROUND. This Order replaces Energy Research and Development Administration Manual Appendix 7401-A, SAFEGUARDS CONTROL AND MANAGEMENT OF NUCLEAR MATERIAL, PRINCIPLES AND GENERAL STANDARDS.
4. REFERENCES.
 - a. DOE 5630.1, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, of 8-3-79, which establishes the responsibilities and authorities for material control and accountability.
 - b. DOE 5632.2, PHYSICAL PROTECTION OF SPECIAL NUCLEAR MATERIALS, of 2-16-79, which establishes minimum physical protection standards for special nuclear materials.
 - c. "Safeguards Analytical Laboratory Evaluation (SALE) 1977 Annual Report," Volume I, New Brunswick Laboratory report NBL-290, May 1978.

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5. RESPONSIBILITIES AND AUTHORITIES. See DOE 5630.1, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, of 8-3-79.



William S. Heffelfinger
Director of Administration

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CHAPTER I

DEFINITIONS

1. ACCURACY of measurement indicates the agreement between the true value and the measured value. The "true" value is considered to be the best obtainable value and is arrived at usually by multiple measurement of standard or reference materials.
2. ALARM LIMITS are the established values for inventory differences which when exceeded require immediate action and reporting to the cognizant operations office and the Office of Safeguards and Security (DP-30). For processing, production, and fabrication operations, alarm limits will be established with a 99 percent probability.
3. APPARENT LOSS is the inability to locate physically or to otherwise account for:
 - a. Any identifiable or discrete item (e.g., batch, lot, or piece) containing nuclear material.
 - b. An inventory difference quantity of nuclear material where the book inventory is larger than the physical inventory by an amount which is in excess of the established alarm limit.
4. BOOK INVENTORY is the amount of material present at a given time as reflected by accounting records such as the general and subsidiary ledgers, i.e., the beginning physical inventory adjusted for receipts and removals for a given reporting period.
5. BULK MATERIALS are materials in any physical or chemical form which are not identifiable as discrete items and thus must be accounted for by weight, volume, sampling, and chemical analysis or nondestructive analysis.
6. CATEGORY I QUANTITIES OF SNM.
 - a. Uranium 235 (contained in Uranium enriched to 20% or more in the isotope U-235) alone, or in combination with Plutonium and/or Uranium 233 when (multiplying the Plutonium and/or Uranium 233 content by 2.5) the total is 5,000 grams or more.
 - b. Plutonium and/or Uranium 233 when the Plutonium and/or Uranium 233 content is 2,000 grams or more.

7. CATEGORY II QUANTITIES OF SNM.
 - a. Uranium 235 (contained in Uranium enriched to 20% or more in the isotope U-235) alone, or in combination with Plutonium and/or Uranium 233 when (multiplying the Plutonium and/or Uranium 233 content by 2.5) the total is 1,000 to 4,999 grams.
 - b. Plutonium and/or Uranium 233 when the Plutonium and/or Uranium 233 content is 400 grams to 1,999 grams.
8. CATEGORY III QUANTITIES OF SNM.
 - a. Uranium 235 (contained in Uranium enriched to 20% or more in the isotope U-235) when the total is 1 gram to 999 grams.
 - b. Plutonium and/or Uranium 233 when the Plutonium and/or Uranium 233 content is 1 gram to 399 grams.
 - c. Combinations of Plutonium and/or Uranium 233 with Uranium 235 (contained in Uranium enriched to 20% or more in the isotope U-235) when the total is less than 1,000 grams and the Plutonium and/or Uranium 233 content is less than 400 grams.
 - d. Uranium 235 contained in Uranium enriched to less than 20% in the isotope U-235 in all quantities above .99 grams.
9. CATEGORY IV QUANTITIES OF SNM. Reportable quantities and above not covered by Categories I, II, or III.
10. CONFIRMATORY MEASUREMENT is a measurement made to test if some attribute or characteristic of the nuclear material is consistent with the expected response for that material if no change has occurred. A confirmatory measurement may include go/no-go, qualitative, semiquantitative, or verification measurements.
11. CONTROL LIMITS are the established values beyond which any variation, in this case inventory difference, is considered to be an indication of the presence of an assignable cause, and the variation should be investigated. Control limits should usually be established with a 95 percent probability and called warning limits, while those usually with a 99 percent probability are called alarm limits.
12. EQUIPMENT HOLDUP is an estimated or measured quantity of nuclear material which adheres so tenaciously to the equipment that it has become part of the equipment or requires special treatment to remove.

13. FACILITY is a generic term used to refer to an integral nuclear material handling complex, usually operated by a single contractor.
14. GRADED SAFEGUARDS is a system designed to provide varying degrees of physical protection, accountability, and material control to different types, quantities, and chemical composition, physical form and isotopic composition of SNM consistent with varying levels of attractiveness and convenience to possible adversaries.
15. IN-PROCESS INVENTORY refers to the quantity of nuclear material present in a fabrication or process line, in processing vessels and machines at any specified time.
16. INTERNAL CONTROL SYSTEM is a set of administrative and accounting policies and procedures implemented by a facility in order to account for and maintain control of nuclear material. It includes checks and balances in the division of duties so designed that the work of one will serve to verify the work of another.
17. INVENTORY DIFFERENCE (ID) is the algebraic difference between the nuclear material book inventory (BI) and a physical inventory (PI), i.e., $ID = BI - PI$.
18. IRRADIATED MATERIAL refers to nuclear material which has been exposed to radiation, as from a nuclear reactor, and as a consequence delivers an external radiation dose rate which requires special containment, handling, and measurement procedures because of the penetrating radiation levels.
19. LIMITS OF ERROR of an estimator T, as applied to this directive, is twice the standard deviation of T unless otherwise stipulated.
20. MATERIAL BALANCE AREA (MBA) is an identifiable physical area wherein the quantity of nuclear material being moved into or out is represented by a measured value.
21. MATERIAL CONTROL AND ACCOUNTABILITY PLAN is a detailed description of the requirements for measurements, statistics, inventory, and the records and reports system all quantified as to precision and accuracy, and timeliness. The plan should include information about required programs for scales and balances, calibration, sampling, and similar subjects which are essential to the establishment of performance specifications.
22. MATERIAL CUSTODIAN is an individual assigned responsibility for the control of nuclear material in a localized area of a facility. The localized area should be limited, where practical, to a single material balance area.

23. MEASURED VALUE refers to one or more quantitative or qualitative characteristics that have been determined for a nuclear material item and implies associated limits of error.
 - a. The measured value may be quantities of nuclear material determined by sampling and analysis, weight, volume determination, nondestructive assay, or other appropriate means.
 - b. The measured value may be calculated on the basis of a chemical analysis or nondestructive assay of a representative sample.
 - c. For the purposes of this directive, a discrete, identifiable item is considered to have a measured value if previously measured and if the integrity of the item can be assured according to procedures approved by the cognizant operations office.
24. NONDESTRUCTIVE ASSAY (NDA) is a measurement technique which can provide quantitative or confirmatory measurements of nuclear materials without altering their chemical or physical form.
25. NUCLEAR MATERIALS is a collective term which includes all materials designated from time to time by the Secretary and to which the provisions of this directive apply. (Figure 1 contains a listing of materials currently designated as nuclear materials and includes source material.)
26. NUCLEAR MATERIALS SURVEY refers to the comprehensive examination and evaluation of the effectiveness of the material control and accountability of nuclear materials at DOE contractor facilities.
27. PRECISION is a quantitative measure of the variability of a set of repeated measurements of a given item.
28. PROCESS HOLDUP refers to nuclear material which, although physically inside the process equipment, is part of the flow and is subject to cleanout.
29. PROGRAMMATIC RESPONSIBILITY refers to the function of cognizant Headquarters organizations in sponsoring work in which specified nuclear materials are being used. It includes primary contract administrative responsibility for such programs in instances where no operations office has responsibility for the technical direction of programs.
30. REPORTING IDENTIFICATION SYMBOL (RIS) consists of a unique combination of three or four letters which are assigned to each reporting facility by the Office of Safeguards and Security (DP-30) and/or the Nuclear Regulatory Commission (NRC) for purposes of identifications in the nuclear materials management data base.

31. SAFEGUARDS is an integrated system of physical protection, accountability, and material control measures designed to deter, prevent, detect, and respond to unauthorized possession and use of special nuclear materials. In practice, it is the development and application of techniques and procedures dealing with the establishment and continued maintenance of a system of activities including physical protection, quantitative knowledge of the location and use of special nuclear materials, and administrative controls and surveillance to assure that procedures and techniques of the system are effective and are being carried out. Safeguards includes the timely indication of possible diversion or credible assurances by audits and inventory verification that no diversion has occurred.
32. SOURCE MATERIAL refers to (a) uranium, thorium, or any other material determined pursuant to the provisions of Section 61 of the Atomic Energy Act of 1954, as amended, to be source material, or (b) ores containing one or more of the foregoing materials, in such concentration as may by regulation be determined from time to time (see Figure 2).
33. SOURCE AND SPECIAL (SS) MATERIALS (Obsolete term - see nuclear materials).
34. SPECIAL NUCLEAR MATERIAL (SNM) means (a) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, has been determined to be special nuclear material, but does not include source material; or (b) any material artificially enriched by any of the foregoing, but does not include source material.
35. TAMPER INDICATING DEVICES (TIDs) are devices which may be used on containers and areas which, because of their uniqueness in design or structure, reveal violations of their containment integrity. TIDs include seals, mechanisms, containers, and enclosures.
36. VERIFICATION MEASUREMENT is a quantitative remeasurement to verify an existing measured value as previously recorded.
37. WARNING LIMIT is a quantity limit for inventory differences which when exceeded requires investigation and appropriate action. For processing, production, and fabrication operations, warning limits will be established with a 95 percent probability.

CHAPTER II
REQUIREMENTS

1. GENERAL. The nuclear programs at DOE license-exempt contractors are complex and varied and the safeguards systems (particularly the material control and accountability components of these safeguards systems) are equally technically complex and varied. This Order provides requirements for the material control and accountability components. Facility-specific material control and accountability systems are to be approved at the operations office level.
 - a. All nuclear materials (NM) shall be controlled and accounted for as required by this directive. A graded material control and accountability program may be implemented by operations offices using requirements for Category IV (Figure 2) as the minimum for NM, other than SNM consistent with the intrinsic value and operational needs of these materials. A graded material control and accountability program shall be implemented as specified in this directive for special nuclear material.
 - b. Each facility shall designate, for approval by the operations office manager, a management official who will be directly responsible for the control of and accounting for nuclear material. This official should be organizationally independent from persons responsible for program operations.
 - c. A material control and accountability plan shall be developed for each facility possessing SNM, approved by the cognizant operations office with change control also exercised by that operations office, and submitted to the Office of Safeguards and Security (DP-30) for review. The plan should reflect requirements for containment, surveillance, internal control, measurements, statistics, records and reports system, and inventory certification(s), in the context of quantitatively how precisely is the inventory known at stated risks or confidence levels. It should include such details as programs for scales and balances, calibration and sampling precision constraints, and validation procedures. The elements of this plan should be treated individually and in a collective sense.
 - d. Each facility shall have, and require compliance with, one or more current procedure directive(s) implementing its material control and accountability plan covering in specific detail its nuclear material control and accountability activities. These procedures shall be appropriately interfaced with the physical protection and security requirements of the DOE 5632 series to provide the necessary effective integrated safeguards system. Further, these procedures should be developed with consideration of health, safety, and environment. The facility procedure directive(s) must be approved by the cognizant operations office prior to its (or their) implementation.

- e. Custodians and handlers of special nuclear material shall receive initial and periodic (at least annual) training on their duties, responsibilities, and obligations.
- f. Annually, by December 1, each operations office manager shall submit a report to the Under Secretary, with copies to the Assistant Secretary for Defense Programs, the Inspector General, outlay program managers, and the Director of Safeguards and Security, on the state of safeguards and security of SNM under their responsibility. This report should include, at a minimum:
 - (1) Improvements achieved in the prior 12 months,
 - (2) Known deficiencies for which budget funds have been appropriated and the status of corrective action;
 - (3) Planned improvements which have not yet been placed in the budget cycle;
 - (4) A summary of the manager's assessment of current capabilities of each facility to meet identified safeguards and security requirements, including residual vulnerabilities, and
 - (5) Suggested activities that Headquarters could undertake that would assist managers in meeting their responsibilities.

2. ACCOUNTABILITY.

- a. Operations offices and facilities shall establish and follow a graded safeguards program for SNM. Graded safeguards is the concept of providing the greatest relative amount of control and effort to that SNM which is most effectively used in a nuclear explosive device. This means that plutonium-239, uranium (>20% U-235), and uranium-233, in the form of metal and compounds should receive more stringent controls than special nuclear material that must be processed, transmuted, or enriched to make it useable in an explosive device. Material in the most useable form must be inventoried frequently, placed under the tightest administrative controls, and, according to DOE 5632 series requirements, must be subject to the most stringent physical protective measures. A categorization for the graded program for nuclear materials, by material balance area, is shown in Figure 1. Figure 2 shows the minimum requirements for each category. A relative order of attractiveness of specific fabricated material forms and the categorization of these fabricated materials shall be a part of the facility procedure directive(s) which is (are) approved by the cognizant operations office.

The following figure shows the name and reportable quantities of nuclear materials.

<u>Name of Material</u>	<u>Other Nuclear Materials</u>	<u>SNM</u>	<u>Source</u>	<u>Reportable Quantities</u>
Depleted Uranium			X	Kilogram
Enriched Uranium		X		Gram
Plutonium-242		X		Gram
Americium-241	X			Gram
Americium-243	X			Gram
Curium	X			Gram
Berkelium	X			Microgram
Californium	X			Microgram
Plutonium 239-241		X		Gram
Lithium-6	X			Kilogram
Uranium-233		X		Gram
Normal Uranium			X	Kilogram
Neptunium-237	X			Gram
Plutonium-238		X		Gram/tenth
Deuterium	X			Kilogram/tenth
Tritium	X			Gram/hundredth
Thorium			X	Kilogram

Changes to this figure will be made as appropriate.

Figure 1
Reportable Nuclear Materials

Category Material	IA (Fig. 4 lines 1-11)	IB (Fig. 4 lines 12-24)	II	III	IV
Pu	≥ 2 Kg	≥ 2 Kg	400-1,999g	1-399g	-
U-233	≥ 2 Kg	≥ 2 Kg	400-1,999g	1-399g	-
U-235 (≥ 20%)	≥ 5 Kg	≥ 5 Kg	1-4.999 Kg	1-999g	-
All Other SNM	-	-	-	Reportable Quantities and above	-
Source and Other Nuclear Materials	-	-	-	-	Reportable Quantities and above

Comments on Figure 2:

1. When reference is made to Category I material, both Categories IA and IB are to be included.
2. Refer to DEFINITIONS for quantities or mixtures.

Figure 2

Material Control and Accountability
Categorization of Nuclear Material

<u>Category (See Figure 2)</u>	<u>Inventory Frequency</u>	<u>Measurement & Statistical Control Programs</u>	<u>DOE Survey Frequency</u>
IA	Daily & Bimonthly	Yes	Yearly
IB	Bimonthly	Yes	Yearly
II	Semiannual	Yes	Yearly
III	Annual	Yes	Yearly
IV	Annual	No	Biennial

Comments on Figure 3:

1. A daily inventory is an administrative determination that no gross irregularities appear to exist, no items are obviously missing, and there is no indication that tampering has occurred.
2. Detailed inventory procedures for SNM should be developed to minimize or eliminate unnecessary radiation exposure to personnel. Where the integrity of containment can be assured, daily, bimonthly, and semiannual inventory steps which will necessarily result in radiation exposure to personnel may be extended to annual. Highly radioactive material (>100 rems per hour at one meter from an unshielded surface) is exempt from the inventory requirements of this directive; instead, book records will suffice supplemented by observation, as feasible, and physical containment and administrative controls. Also see page II-12, paragraph 6, Inventory and Control, for additional explanations of permissible practices.
3. Large throughputs, process controls, or other considerations may require operations office managers to prescribe more frequent inventories.
4. Nuclear material surveys should include an evaluation of contractor nuclear material control and accountability practices and performance in complying with DOE requirements.
5. Bimonthly means once every 2 months.

Figure 3

Minimum Graded Nuclear Material Program Requirements

Category IA Material

1. Assembled Plutonium (Pu* or U-233) Weapons Components.
2. Assembled U-235 Weapons Components.
3. Pu* or U-233 Machined Weapons Parts.
4. U-235 Machined Weapons Parts.
5. Pu* Metal (buttons, rods, pieces).
6. U-233 Metal.
7. U-235 Metal.
8. Pu* Oxides.
9. U-233 Oxides.
10. U-235 Oxides.
11. U-235 Carbides.

Category IB Material

12. Pu-238 Oxide or Metal.
13. Nitrate Crystals and Nitrate Solutions of Pu, U-233, and U-235.
14. Pu, U-233, and U-235 Solutions other than Nitrate.
15. Compounds of Pu, U-233, and U-235 other than those listed in items 8-12 above.
16. Pu Alloys or Oxide, Carbide or Nitride Mixtures.
17. U-233 Alloys or Oxide, Carbide or Nitride Mixtures.
18. U-235 Alloys or Oxide, Carbide or Nitride Mixtures.
19. Pu Fuel Elements and Assemblies.
20. U-233 Fuel Elements and Assemblies.
21. U-235 Fuel Elements and Assemblies.
22. Pu, U-233, and U-235 High-Grade Recoverable Scrap.
23. Pu, U-233, and U-235 in Irradiated Forms.
24. Pu, U-233, and U-235 Low-Grade Recoverable Scrap (Process Residues).

*Excluding Pu-238 and P-242

Figure 4

Example Ranking of SNM According to
Possible Attractiveness for Diversion

- b. Each facility shall maintain readily retrievable accountability data by material balance area (MBA) which reflects the quantities of NM which have been received, shipped, or otherwise removed from the MBA and remaining quantities on inventory with entries capable of being updated on a frequency as specified in the following schedule:
 - (1) For Category IA quantities - daily.
 - (2) For Category IB quantities and all other NM - at least monthly.
- c. Each facility shall establish material balance areas (MBAs) in the sections of the facility where NM are handled and identify and describe such areas and their functions in the facility's material control and accountability directive(s). In general, material balance areas shall meet two criteria:
 - (1) One individual in each MBA shall be responsible for assuring that all material control and accountability policies are implemented in that MBA; and
 - (2) Each MBA shall usually conform to the single geographical area concept and be an integral operation. If several geographical areas are to be included in one MBA, all of these areas must be under the administrative control of the same individual and the activity in all of these areas must be associated with an integral operation.
- d. If the isotope content of SNM (excluding uranium enriched below 20 percent U-235) transferred between material balance areas is 50 grams or more, the transfer must be measured, or a confirmatory measurement made, by the receiver. Exceptions: Transfers of SNM which (1) are tamper-safed; (2) consist of assembled components with SNM components which are not physically readily accessible; or (3) are sent to laboratories for analysis or examination and return within 72 hours under conditions which provide adequate internal controls to maintain a continuous awareness of the location and integrity of the SNM until it is returned.
- e. After obtaining operations office approval for the procedures to be used, each facility shall implement procedures for evaluating SNM inventory differences (IDs). The procedures shall establish control limits, require follow-up investigations when these limits are exceeded, and require statistical tests for trends and bias. Alarm limits and warning limits are to be classified in accordance with CG-S-1, "Classification Guide for Safeguards Information." The local classification officer should be consulted concerning the classification of information used in establishing those limits. The level of investigation required and the assignment of responsibility in the implementation would depend on the material involved and the magnitude of the inventory difference. Similar or modified requirements of this nature at the option of the operations

office manager may be required for other materials listed in the chart of reportable nuclear materials. The procedures for determining the control limits shall be based on one or more of the following: propagation of measurement uncertainties and related variabilities, material flow simulation modeling, or any other approved technique which is based on sound statistical theory and practice. Historical data may be used alone as an interim measure until limits can be established as outlined above.

f. The reporting and investigation of IDs not involving a specific item, which must be in conformance with existing classification guidance, will be as follows:

(1) IDs in Excess of Warning Limits but Less than Alarm Limits.

- (a) For Category I and Category II materials, the ID shall be reported promptly to the cognizant operations office manager, and shall be investigated immediately. If the investigations do not result in a satisfactory and compatible explanation within 10 days, the ID shall be reported to the appropriate Headquarters (HQ) program organization, and to the Office of Safeguards and Security, HQ, who will provide copies to other concerned HQ organizations, and through the Assistant Secretary for Defense Programs to the Under Secretary and the Inspector General. If the ID is an underage/"loss" and if the investigation provides a basis for concluding that theft or diversion has taken place, the operations office should promptly notify the local Federal Bureau of Investigation (FBI).
- (b) For other SNM, the ID shall be reported promptly to the cognizant operations office and investigated promptly by the contractor.

(2) IDs in Excess of Alarm Limits.

- (a) For Category I and Category II materials, the ID shall be reported immediately to the cognizant operations office manager who will report it immediately to the Office of Safeguards and Security, HQ, to the appropriate Headquarters organizations, and to the FBI (in the case of underage/"loss," not overage/gain). The ID shall be investigated immediately. The Office of Safeguards and Security will provide copies of the report to the Under Secretary, the Inspector General, and other concerned HQ organizations.
- (b) For other SNM, the ID shall be reported immediately to the cognizant operations office manager. The ID shall be investigated promptly by the contractor.

(3) IDs Involving a Missing Item of SNM.

For any ID involving a missing item of SNM, the missing item shall be investigated immediately and reported to the cognizant operations office at once. The Office of Safeguards and Security (DP-30), the appropriate Headquarters organizations, and the FBI shall be informed immediately of any indication of theft or of possible danger to health and safety of the public, and in any case within 24 hours if the missing item is not found. The Office of Safeguards and Security will provide copies to the Under Secretary (through the Assistant Secretary for Defense Programs), the Inspector General, and other concerned HQ organizations.

3. MEASUREMENT AND STATISTICAL CONTROL PROGRAMS.

- a. Each facility shall establish and maintain appropriate measurement program(s) for all SNM. The accuracy and precision of the various techniques shall be consistent with a graded safeguards system. Where required and/or as appropriate, verification or confirmatory measurements may be made using NDA or other accepted measurement methods. A measurement program for other nuclear materials may be conducted where necessary to assure adequate accountability consistent with operational needs and the intrinsic value of these materials.
- b. Each facility shall implement measurement control programs for all measurement systems used for the accountability of SNM. These programs shall be consistent with a graded safeguards system and shall be referenceable to and validated by a national measurements and standards program, where practicable, and shall include:
 - (1) Scale and Balance Program. All scales and balances shall be maintained in good working condition and calibrated pursuant to an established control program.
 - (2) Analytical Quality Control Program. Data from routine testing shall be analyzed statistically to determine and maintain accuracy and precision of the methods.
 - (3) Sample Variability Control Program. The uncertainty (variance) associated with each sampling method shall be determined, minimized, and maintained on a current basis.
 - (4) Control Program for Volume, Temperature, and Pressure Measurements. The precision and accuracy of volume, temperature, and pressure determinations shall be obtained by appropriate techniques, and periodic checks of such calibrations shall be made.

- (5) Calibration Program for Nondestructive Assay Measurements. Nondestructive assay instrumentation shall be calibrated with appropriate standards and monitored periodically to ensure proper function within established control limits. Assay predictions periodically should be compared with more accurate measurements of the content of typical materials.
 - (6) Sample Exchange Program. Facilities should, to the extent practicable, participate in extralaboratory control programs such as the Safeguards Analytical Laboratory Evaluation Program (SALE), to provide external demonstration of the adequacy of an internal quality control program.
- c. Measurement control programs for the other NM shall be developed to maintain adequate accountability consistent with the intrinsic and management value of these materials.

4. TAMPER-INDICATING DEVICES.

- a. Facilities shall, to the maximum extent practical and possible, use tamper-indicating devices (TIDs) with appropriate written implementing procedures for their use on special nuclear material, unless the cognizant operations office grants an exemption for irradiated items, extruded fuel tubes or targets, or sealed sources. Such devices and procedures must be acceptable to the cognizant DOE operations office. Use of such tamper-indication devices shall include, as appropriate, written procedures for, and compliance with, the following:
 - (1) Serialization (where appropriate);
 - (2) Prevention of reusability after the seal has been violated;
 - (3) Resistance to environmental factors which could conceal any indication of tampering;
 - (4) Control of their acquisition, shipment, use, and storage;
 - (5) Retention of comparative samples of TIDs for reference purposes;
and
 - (6) Presence of two authorized individuals when a TID is applied to assure the integrity of the sealed item.

5. EXTERNAL TRANSFERS.

- a. The transfers of NM from one facility to another shall be documented by the DOE/NRC Form-741, Nuclear Material Transaction Report, which shall be

prepared and distributed to the principals of the transaction and the cognizant operations office desirably on the day of the transfer, but within 24 hours, or on the first work day after the transfer should it occur on a nonwork day. Measured values should be used for all Category I and II material transfers (see paragraph 5.b.). Measured values should be used for SNM and other NM transfers consistent with the intrinsic and/or monetary value(s) of the NM and as required for associated environmental, safety, and operational controls.

- b. All unirradiated Category I and II material transferred between facilities shall have, to the extent possible but consistent with the graded safeguards concept, independently measured values determined by the shipper and the receiver. The shipper's measured values shall be determined prior to shipment unless the integrity of the existing measured values has been assured. Normally, the receiver's measured values shall be determined within 10 calendar days from the date of receipt of the material or transfer document, whichever is later. When this is not possible, confirmatory measurements shall be used on an interim basis for accepting the transfer.
- c. As soon as possible, but in no case more than 1 work day after receipt of Category I materials, the identification and integrity of the shipper's tamper-safing devices on each item or container should be verified. The piece count and identification and gross weight of the items or containers received should be checked against the bill of lading, Form DOE/NRC-741/ 741A, or other appropriate shipping document to provide assurance that the shipment was received intact.
 - (1) For receipts involving accessible (for sampling or direct NDA measurement) Category I and II materials that are originally accepted by confirmatory receipt measurements, these materials should not enter any chemical separation step until the receiver has independently measured values or unless DOE-approved procedures, including those to evaluate and resolve significant shipper/receiver differences, have been established.
 - (2) For receipts involving inaccessible Category I and II material under circumstances which preclude the use of NDA techniques for verification measurements, the shipper's values may be accepted by the receiver without direct or confirmatory measurements if the shipper's TID is found intact by the receiver and an independent agent was present to verify the shipper's package measurement and application of a TID.
- d. For shipments of unirradiated SNM greater than 250 grams (multiplying the plutonium and uranium-233 weights by 2.5 and adding to this the uranium-235 weight), and for each discrete item exceeding 250 grams, limits of

error shall be assigned by the shipper and receiver to their measurements, at the 95 percent confidence level, for both the element and isotope values. For shipments of unirradiated accessible SNM of less than 250 grams, the shipper and receiver may estimate the limits of error for the shipment.

- e. Calculated limits of error are required for all measurements of external transfers of tritium, except shipments of reservoirs.
- f. Limits of error are not required for spent fuel shipments.
- g. The requirements of Section 9-50.402 of the DOE Procurement Regulations and other DOE Orders in the 5630 series also apply.

6. INVENTORY AND CONTROL.

- a. Each facility having Category IA material shall develop and implement daily administrative control procedures for each MBA having Category IA quantities which take into account the specific nature of the operations within that MBA. These procedures shall be designed to detect abnormal situations and shall be interfaced with the facility's physical protection program. Any noted abnormalities shall be reported immediately to the appropriate facility official.
- b. Each facility shall implement a physical inventory program and written inventory plan for nuclear materials which will include:

(1) Bimonthly Physical Inventories.

- (a) Facilities shall perform bimonthly physical inventories of Category I materials (Figure 2). All such SNM shall be inventoried with measured values and, where feasible, measurements or estimates of holdup shall be made so that it can be identified in categorizing the inventory difference. Material undergoing processing and recovery operations, and which is inaccessible for measurements by sampling, should be accounted for by use of process data, vessel level and density measurements and calculated concentration values. Plant operational data such as vessel levels, density readings, and sensors should be utilized to monitor process conditions on a routine basis. This process monitoring, in addition to material control procedures, measurements, and specific action criteria, subject to the approval of the cognizant operations office, should be used to routinely track materials in process until operations permit a complete inventory.
- (b) The complete inventories should be conducted on a schedule established by the operations office manager, but no less

frequently than annual, unless the facility can demonstrate that an alternative inventory procedure (e.g., dynamic inventory - in-process or continuous) can produce results equivalent to a complete cleanout inventory. The physical inventory procedures shall provide for a documented listing of items showing the serial number, the amount of material, the chemical or physical form, the location, and/or any other data which would be required to uniquely identify and control each item. For inventories containing large numbers of individual items or irradiated nuclear items (e.g., fast critical reactors), statistical sampling plans as approved by the cognizant operations offices may be utilized. Critical facilities require alternative controls to minimize physical handling of the fuel. A system of alternative controls should be clearly defined and approved by the cognizant operations office. Such a system will provide safeguards comparable to that obtained by using frequent physical inventories. The extensive use of inventory sampling plans, tamper-indicating devices, and mechanical inventory techniques, and any other techniques which would minimize personnel exposure to radiation is recommended.

- (c) Operations office managers may approve exceptions to inventory frequency requirements for critical assemblies i.e., zero power reactors, when significant time is required to disassemble the critical assembly to gain access to the fuel. However, checks of facility records and inspections of the critical assemblies should be made at the frequency that a physical inventory would otherwise be performed to provide assurance of satisfactory fuel containment. Excepted critical assemblies shall be inventoried during routine disassembly. Irradiated nuclear material in long term storage or in operations which are inaccessible for unique identification or individual piece counting because of radiation levels, should be accounted for based on a principle of containerization where the items are identified, if possible, or (at a minimum) counted at the time the container batch is made up. Containers may be buckets, uniquely identified zones in the fuel storage area, or any other well-defined three dimensional space that will remain unchanged during the inventory period. Containers shall be uniquely identified including serial numbers, dimensions (if applicable), listing of contents, and location or grid number. The control of material in containers should follow the practices for individual items, including the use of such things as TIDs, wherever possible, and control of operations that might lead to unreported changes in the batch content. Further, physical inventories shall be conducted in a systematic manner, shall be designed to avoid duplication, and shall provide for assurance of the integrity of tamper-indicating devices.

- (2) Semiannual Physical Inventories. Facilities shall perform semiannual physical inventories of Category II materials (Figure 2). All such materials except in processing and recovery operations shall be, where possible, inventoried using measured values and, where feasible, measurements or estimates of holdup shall be made so that it can be identified in categorizing the inventory difference. Material undergoing processing and recovery operations, and which is inaccessible for measurements by sampling, should be accounted for by use of process data, vessel level and density measurements, and calculated concentration values. Plant operational data such as vessel levels, density readings, and sensors should be utilized to monitor process conditions on a routine basis. This process monitoring, in addition to material control procedures measurements, and specific action criteria, subject to the approval of the cognizant operations office should be used to routinely track materials in process until operations permit a complete inventory. When item identification of individual items cannot be accomplished, there shall be an approved procedure for assuring the accuracy of the accountability records. The complete inventories should be conducted on a schedule established by the operations office manager, but no less frequently than annual, unless the facility can demonstrate that an alternative inventory procedure can produce results equivalent to a complete cleanout inventory. The physical inventories shall be conducted as outlined for bimonthly physical inventories in paragraph 6b(1).
- (3) Annual Physical Inventories. Facilities shall perform physical inventories of reportable quantities of all other NM. All such materials in processing and recovery operations shall be inventoried with measured values and, where feasible, measurements or estimates of holdup shall be made so that it can be identified in categorizing the inventory difference. The physical inventories shall be conducted as outlined for bimonthly inventories in paragraph 6b(1).
- (4) Special Physical Inventories. Each facility's safeguards program shall include provisions for special inventories of SNM as a result of changes in custodial responsibilities, missing items, large or unexpected inventory differences, or requests from facility management or the manager of the cognizant operations office.
- (5) Physical Inventory Reconciliation Program. Each facility shall implement a physical inventory reconciliation program associated with the above physical inventories which is designed to provide assurance that all nuclear material items have been accounted for and that the facility's record system reflects the physical inventory. Upon completion of the physical inventory, the perpetual (book) inventory for each material balance area must be compared with and, if necessary,

be adjusted to the physical inventory. If the material in the inventory is composed of discrete items and a statistical sampling plan is used to conduct the physical inventory, the reconciliation may be made without separately locating and listing the balance of the material in the inventory.

c. Each facility shall implement a physical inventory measurement program for SNM items as follows:

- (1) Items With Tamper-Indicating Devices. A confirmatory measurement program shall be developed to ensure the integrity of SNM protected by tamper-indicating devices and may follow the graded concept. These confirmatory measurements may be performed on the basis of a statistical sampling plan during the physical inventory or between inventories.
- (2) Items Without Tamper-Indicating Devices. A verification measurement program shall be developed at the MBA Level, shall be based on statistical sampling plans, and shall follow the graded concept.

7. INTERNAL CONTROL AND REVIEWS.

a. Operations offices shall assure that their contractors establish and maintain an internal control system. Properly designed and implemented, an internal control system will:

- (1) Provide needed information concerning the location or disposition of material quantities;
- (2) Reduce the probability of errors in records and reports which might result through improper handling of data or documents, or through use of data of poor quality;
- (3) Decrease the risk of and detect theft or other unauthorized or unknown use of material;
- (4) Provide a system of checks and balances in the record systems and in the division of duties, so that the work of one person verifies the work of another, and
- (5) Provide a system of checks on the materials measurement system.

b. The internal control system shall address:

- (1) The organizational structure;
- (2) The responsibilities regarding nuclear materials;

- (3) The receiving functions,
 - (4) The shipping functions;
 - (5) The accountability records system,
 - (6) The custodial functions including physical inventories,
 - (7) The materials measurement system;
 - (8) The effectiveness of the interfacing of nuclear material control and accountability subsystems with each other and the physical protection subsystem of the facility's overall safeguards system, and
 - (9) The internal audit functions.
- c. Each facility possessing Category I quantities of SNM shall provide assurance to the appropriate operations office of the effectiveness of the integrated system of physical protection, and material control and accountability measures in deterring, preventing, detecting, and responding to the theft of SNM.

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.3

1-6-81

SUBJECT: DOCUMENTATION OF NUCLEAR MATERIAL TRANSACTIONS

1. PURPOSE. This Order establishes policies and defines procedures for the proper documentation of nuclear material transactions.
2. SCOPE. The provisions of this Order shall apply to all elements of the Department of Energy, its license-exempt contractors, to United States Nuclear Regulatory Commission and "Agreement State" licensees that are Department of Energy contractors and to those facilities which have been assigned Reporting Identification Symbols beginning with the letter "V" which are Department of Energy contractor waste management sites.
3. BACKGROUND. This Order replaces Atomic Energy Commission Appendix 7401-C, Part II, DOCUMENTATION OF TRANSACTIONS, and all previous Atomic Energy Commission and Energy Research and Development Administration issuances (i.e., Atomic Energy Commission Immediate Action Directives and Atomic Energy Commission, Energy Research and Development Administration, and Department of Energy memoranda of instructions) pertaining to the documentation of nuclear material transactions.
4. REFERENCES.
 - a. DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80, contains the basic definitions, principles, and requirements for control and accountability of nuclear materials.
 - b. Code of Federal Regulations, Title 10--Energy, contains the regulations applicable to United States Nuclear Regulatory Commission and "Agreement State" licensees involved in activities concerning nuclear materials not subject to Department of Energy requirements.

DISTRIBUTION:
All Departmental Elements
Federal Energy Regulatory Commission (info)

INITIATED BY:
Office of Safeguards
and Security

- c. "Directory of Reporting Identification Symbols" contains a list of all valid Reporting Identification Symbols for United States nuclear facilities, United States government agencies, and foreign entities. This document also lists names, addresses, and telephone numbers of the facilities, agencies, or foreign entities, and any special requirements for notification concerning shipment of nuclear material. The "Directory of Reporting Identification Symbols" and periodic updates and revisions are available from the Office of Safeguards and Security (DP-30).
- d. Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, with Protocol, is a treaty between the United States and the International Atomic Energy Agency which provides for the application of International Atomic Energy Agency safeguards to nuclear materials in certain selected facilities in the United States. Details of the specific safeguards requirements for specific facilities are contained in Facility Attachments or Transitional Facility Attachments negotiated pursuant to the Agreement. Copies of this document are available from the United States Government Printing Office.
- e. "INMTS Data Collection Procedures" is a manual for preparation and submission of information concerning United States nuclear materials in foreign countries. This document is available from the Oak Ridge Operations Office.
- f. DOE 5630. , NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81, describes the procedures and requirements for preparation and submission of nuclear materials transaction, inventory, and material balance data to the Nuclear Materials Management and Safeguards System.

5. DEFINITIONS.

- a. Nuclear Materials Management and Safeguards System is the national data base and information support system for nuclear materials controlled by the United States Government, created to support national safeguards and management objectives in the domestic and foreign utilization of nuclear resources.
- b. Country Control Numbers are eight-character code numbers used in nuclear materials documentation and reporting to indicate the country in which the nuclear material was produced, enriched, utilized in a reactor, or had safeguards conditions attached to its use or transfer.

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- c. Reporting Identification Symbols are unique combinations of three or four letters which are assigned to each reporting facility for the purpose of identification in the nuclear materials management data base. Information relating to the construction and interpretation of Reporting Identification Symbols is contained in the "Directory of Reporting Identification Symbols" referenced in paragraph 4c.
- d. International Nuclear Materials Tracking System is a data base and information support system used to manage information on the quantity and location of United States-supplied nuclear materials in foreign countries.
- e. Categories I and II are quantities of special nuclear material or mixtures thereof which are sufficiently large to be worthy of special procedures for measurement, accountability, and control. Precise definitions of these categories appear in DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80.

6. FORMS.

- a. DOE/NRC Form 741, Nuclear Material Transaction Report, and DOE/NRC Form 741A, Nuclear Material Transaction Report (Continuation Page), contain the information necessary for the documentation of transactions involving nuclear materials. A computer-generated or internal equivalent of these forms may be used. However, any computer-generated or internal equivalent must contain all data required for proper documentation of nuclear material transactions, and prior to use, must be approved by the Office of Safeguards and Security.
 - (1) DOE/NRC Form 741 and DOE/NRC Form 741A (or approved equivalents) shall be used to document transfers of nuclear material between facilities, adjustments to inventories, programmatic transfers within facilities, and changes in financial responsibility.
 - (2) DOE/NRC Form 741 and DOE/NRC Form 741A (or approved equivalents) shall be used to document inventory changes by all Department of Energy facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.
- b. Form DOE-284, Nuclear Material Transfer Receipt, is used to report receipt and confirmatory measurement of nuclear material in those cases where the receiver cannot determine independent measured values within 10 days of receipt of the nuclear material. A computer-generated equivalent of this form may be used provided that it contains all information necessary for

proper confirmation of receipt of nuclear material and has been approved by the Office of Safeguards and Security prior to use.

- c. DOE/NRC Form 741, DOE/NRC Form 741A, and Form DOE-284 shall be designed so as to contribute to the overall safeguards control of nuclear material. Data on these forms shall be reported to the Nuclear Materials Management and Safeguards System in accordance with the provisions of DOE 5630. , NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81.

7. RESPONSIBILITIES AND AUTHORITIES.

- a. Office of Safeguards and Security shall develop policies, procedures, and standards designed to document the transfer of special nuclear material and other designated nuclear materials binding on all Department of Energy Elements, contractors, and subcontractors. The Office shall assure that these policies, procedures, and standards are comparable in their effectiveness to those adopted by the United States Nuclear Regulatory Commission. The Office will review proposed equivalents to DOE/NRC Form 741, DOE/NRC Form 741A, and Form DOE-284, and, if the equivalents are found to contain all necessary data in the proper format, approve their use in lieu of DOE/NRC Form 741, DOE/NRC Form 741A, or Form DOE-284.
- b. Heads of Field Organizations shall develop appropriate instructions which require each contractor and facility under their reporting jurisdiction to:
- (1) Prepare and distribute promptly, appropriate copies of DOE/NRC Form 741, DOE/NRC Form 741A, and Form DOE-284, or approved equivalents of these forms.
 - (2) Compile transaction data and submit the data to the Nuclear Materials Management and Safeguards System, in accordance with the provisions of DOE 5630.6, NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81.
 - (3) Determine the reasons for shipper-receiver differences, evaluate the significance of all such differences, and take appropriate corrective action. The field organization may direct the contractor to take other actions to resolve shipper-receiver differences.
- c. Manager, Oak Ridge Operations Office, in addition to the requirements specified in paragraph 7b, shall extract information from documents used to transfer United States nuclear material from one foreign country to another and submit such data to the International Nuclear Materials Tracking System in accordance with "INMTS Data Collection Procedures" (referenced in paragraph 4e). The Manager shall forward applicable copies of United States Nuclear Regulatory Commission or "Agreement State" licensee Nuclear Material Transaction Reports promptly to other concerned Department of Energy Elements and to appropriate foreign entities. In addition, the Manager shall maintain records that document

all transfers of nuclear material to and from foreign entities, and issue required inventory reports. All transfer documents, records, and reports shall be retained for audit purposes. Sufficient records shall be maintained to document the transfer of any United States-supplied special nuclear material to foreign entities, the receipt of any United States origin nuclear material into the United States, and the transfer of any United States origin nuclear material between foreign countries, including special nuclear material produced therein in accordance with appropriate agreements.

- d. Manager, Albuquerque Operations Office, in addition to the requirements specified in paragraph 7b, shall maintain memorandum inventory accounts for all transfers of nuclear material to the Department of Defense under 42 U.S.C. §§2121(b)-(c), with the exception of Navy cores and associated items. The Manager shall provide guidance and instruction as necessary to those offices making such transfers.
- e. Manager, Pittsburgh Naval Reactors Office, in addition to the requirements specified in paragraph 7b, shall maintain memorandum inventory accounts for transfers of nuclear materials in Navy cores and associated items to the Department of Defense under 42 U.S.C. §2121(b).

8. PROCEDURES AND REQUIREMENTS.

a. Use of DOE/NRC Form 741 and DOE/NRC Form 741A.

- (1) General. All transfers of special nuclear material, source material, and certain other materials (specified in Figure 1) between Reporting Identification Symbols within the United States, or between facilities in the United States and foreign entities, shall be documented on a Nuclear Material Transaction Report, DOE/NRC Form 741 and DOE/NRC Form 741A, or an approved equivalent. The procedures and requirements for documentation of transactions assure that accountability for nuclear materials is transferred from shipper to receiver.
- (2) Automated Method. Consenting Field Organization Heads may elect to have transfer data automated and transmitted over appropriate telecommunications systems, thus eliminating the manual preparation of DOE/NRC Form 741 or DOE/NRC Form 741A. If this method is used, all procedures and instructions of this Order shall apply except that signatures on the transaction documents no longer shall be necessary. Internal controls shall assure that the data transmitted have been properly authorized. The sender and recipient of such automated messages shall produce hard copies of the messages for use by all parties needing copies. The hard copies shall contain the information normally included in DOE/NRC Form 741 and DOE/NRC Form 741A. The automated method of handling and transmitting transfer data shall follow all requirements of the Code of Federal Regulations (referenced in paragraph 4b) for activities involving United States Nuclear Regulatory Commission or "Agreement State" licensees (i.e.,

<u>Name of Material</u>	<u>Reporting Weight Unit</u>	<u>Element</u>	<u>Weight % Isotope</u>	<u>Isotope</u>
Depleted Uranium	Whole Kg	Total U	U-235	U-235
Enriched Uranium	Whole Gm	Total U	U-235	U-235
Plutonium-242	Whole Gm	Total Pu	Pu-242	Pu-242
Americium-241 ^{1/}	Whole Gm	Total Am	-	Am-241
Americium-243 ^{1/}	Whole Gm	Total Am	-	Am-243
Curium ^{1/}	Whole Gm	Total Cm	-	Cm-246
Berkelium ^{1/}	Whole Microgram	-	-	Bk-249
Californium ^{1/}	Whole Microgram	Total Cf	-	Cf-252
Plutonium	Whole Gm	Total Pu	Pu-240	Pu-239+ Pu-241
Enriched Lithium	Whole Kg	Total Li	Li-6	Li-6
Uranium-233	Whole Gm	Total U	U-232(ppm)	U-233
Normal Uranium	Whole Kg	Total U	-	-
Neptunium-237	Whole Gm	Total Np	-	-
Plutonium-238	Gm to tenth	Total Pu	Pu-238	Pu-238
Deuterium	Kg to tenth	D ₂ O ^{2/}	-	D ₂
Tritium	Gm to hundredth	Total tritium	-	-
Thorium	Whole Kg	Total Th	-	-
Uranium in Cascade	Whole Gm	Total U	U-235	U-235

^{1/} Non-DOE-owned americium-241, americium-243, curium, berkelium, and californium are not subject to the requirements of this Order.

^{2/} If in the form of heavy water; otherwise, leave blank.

Figure 1
Material Reporting Characteristics

commercial waste management sites and those parties with Reporting Identification Symbols beginning with the letters "W" through "Z").

b. Types of Transfers.

- (1) Physical Transfer of Material. The shipper shall either include copies of the transfer report intended for the receiver with each shipment, or dispatch the receiver's and other copies of DOE/NRC Form 741 and DOE/NRC Form 741A, or their approved equivalents, by other means no later than 1 workday following shipment of the material. The receiver shall prepare and distribute the receiver's sections of DOE /NRC Form 741 and DOE/NRC Form 741A, or their approved equivalents, no later than 10 calendar days following receipt of the material. Whenever a facility transfers material to a foreign entity, the shipper shall prepare and distribute the receiver's sections of DOE /NRC Form 741 or DOE/NRC Form 741A, or their approved equivalents, within 1 workday of receipt of the necessary data. Additional guidance may be provided by the shipper's field organization. Whenever a facility receives material from a foreign entity, the receiver shall prepare and distribute the shipper's sections of the forms, or their approved equivalents, no later than 3 workdays following receipt of the material. In those cases where the receiver uses Form DOE-284, as specified in paragraphs 8c(4)(a)-(b), the Form DOE-284 shall be prepared and distributed within 10 calendar days following receipt of the material. If a Form DOE-284 is submitted, the receiver shall prepare and submit DOE/NRC Form 741 and DOE/NRC 741A, or their approved equivalents, no later than 30 calendar days following receipt of the material. Transfers involving the Department of Defense, except for transfers of nuclear material in Navy cores and associated items, shall be documented in accordance with the instructions for such transfers provided by the Albuquerque Operations Office.
- (2) Nonphysical Transfer of Material. DOE/NRC Form 741 or DOE/NRC Form 741A, or their approved equivalents, may be used to record a change in project number, ownership status, or financial responsibility. Such transactions shall be reported to the Nuclear Materials Management and Safeguards System in accordance with the provisions of DOE 5630. , NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6 -81, regardless of the form used for documentation.
- (3) Other Types of Receipts and Removals. Various other types of receipts and removals (e.g., production, transfers to and from other materials, sales, decay, losses, etc.) shall be documented by using DOE/NRC Form 741 and DOE/NPC Form 741A, or their approved equivalents. Such other types of receipt and removal data shall be reported to the Nuclear Materials Management and Safeguards System on a current basis (i.e., as each activity occurs or is identified quantitatively).

c. Special Requirements.

- (1) Special Requirements for Notifying Receiver of Nuclear Material Shipments. Each shipper shall be responsible for advising the intended receiver of proposed shipments of nuclear material and for providing all pertinent advance information. Specific notification requirements applicable to individual facilities are contained in the "Directory of Reporting Identification Symbols" (referenced on page 2, paragraph 4c).
- (2) Reporting of Material in Transit on Domestic Shipments.
 - (a) The shipper shall provide all pertinent quantity information to the receiver for all material in transit at the end of a reporting period. This requirement may be satisfied through the use of automated telecommunications methods only if both shipper and receiver possess the necessary automated capabilities.
 - (b) Radioactive decay shall be reported to the Nuclear Materials Management and Safeguards System by the shipper and receiver for all nuclear materials in transit.
- (3) Tracking of Material Within the United States. Each facility shall submit country control number information in accordance with guidance provided by the Office of Safeguards and Security.
- (4) Determination of Nuclear Material Quantities Transferred.
 - (a) General. All unirradiated Category I and II material transferred between facilities shall have, to the extent possible but consistent with the graded safeguards concept, independently measured values determined by the shipper and the receiver. The shipper shall independently determine measured values prior to shipment unless the integrity of the existing measured values has been assured. Normally, the receiver's measured values shall be determined within 10 calendar days from the date of receipt of the material. When this is not possible, confirmatory measurements shall be used on an interim basis for accepting the transfer. Such interim acceptance is to be documented on Form DOE-284. As soon as possible, but no later than 1 workday after receipt of Category I material, the identification and integrity of the

shipper's tamper-safing devices on each item or container should be verified. The piece count and identification and gross weight of the items or containers received should be checked against the bill of lading, DOE/NRC Form 741 or DOE/NRC Form 741A, or other appropriate shipping document to provide assurance that the shipment was received intact. Measured values should be used for non-Category I and II nuclear material transfers consistent with the intrinsic and/or monetary value(s) of the nuclear material and as required for associated environmental, safety, and operational controls. Measured values shall be determined in accordance with the requirements of DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80. In those cases where the shipper or receiver is a United States Nuclear Regulatory Commission or "Agreement State" licensee, the shipper or receiver shall conform to the requirements of the Code of Federal Regulations.

- (b) Form DOE-284. Form DOE-284 shall be prepared and distributed in accordance with guidance provided by the Office of Safeguards and Security. The information from the Form DOE-284 shall be reported to the Nuclear Materials Management and Safeguards System in accordance with the provisions of DOE 5630.6, NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81. A computer-generated equivalent may be used in lieu of the Form DOE-284 provided that approval has been granted by the Office of Safeguards and Security prior to such use.
- (c) Reporting Units. Element and isotope weight shall be reported in the metric weight units specified for each material type in Figure 1.
- (d) Rounding Policy. Each quantity shown on DOE/NRC Form 741 or DOE/NRC Form 741A shall be rounded to the proper whole reporting unit for that material. Fractions of one-half or greater shall be rounded upward. Where the quantity being transferred is less than one-half a reporting unit (before rounding) it shall be shown as an asterisk to indicate that a transaction occurred.
- (e) Shipper-Receiver Differences. Whenever differences arise between shipper's and receiver's values for the quantity of nuclear material transferred, one of the following procedures is to be followed, depending upon the relative magnitude of the difference:
 - 1 When the shipper-receiver difference is less than or equal to one of the quantities in paragraphs 8c(4)(e)1 a-c, then the difference (plus or minus) need not be investigated, and

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each contractor shall record its own quantitative values. When there is a difference in limits of error with one being more than 1.5 times the other, then both limits should be reviewed to determine which limit or limits are valid and to be used in the resolution.

- a The limit obtained by a statistical combination of the limits of error (Gaussian propagation of error) of the shipper and the receiver, assuming both limits of error are valid as defined in paragraph 8c(4)(e)1; or
 - b The square root of two (1.4) times the valid limit of error, when one limit of error is not valid, as defined in paragraph 8c(4)(e)1; or
 - c The square root of two (1.4) times the only available limit of error, after investigation to provide assurance that this limit is valid as defined in paragraph 8c(4)(e)1.
- 2 When the shipper-receiver difference is greater than any of the quantities specified above in paragraphs 8c(4)(e)1 a-c, but the quantities and dollar value are insufficient to warrant an examination and corrected transfer documents and cost vouchers, and the receiver is the Department of Energy or one of its contractors or subcontractors, the difference need not be investigated and each party shall record its own quantitative value. For purposes of this paragraph, differences valued at less than \$500 are considered insufficient to initiate an investigation, unless there are special circumstances.
- 3 When the shipper-receiver difference is outside the limits specified in paragraph 8c(4)(e)1, the shipper-receiver difference exceeds a value of \$500, or there are special circumstances calling for settlement of a shipper-receiver difference valued at less than \$500, and the receiver is a Department of Energy contractor, the receiver notifies his field organization and supplies details useful in helping to resolve the difference. The receiver's field organization shall immediately notify the shipper and the shipper's field organization, and initiate its own investigation of the receiver's measurements and limits of error. Upon notification of a difference, the shipper shall, under the cognizance of its field organization, conduct an investigation of its measurements and limits of error. Normally such investigation should be completed within 30 days of the date of notification of the difference. Based on these investigations:

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- a If the receiver's field organization obtains adequate assurance from the shipper's field organization that the shipper's measurements and limits of error are valid, then each contractor shall record its own quantitative value.
 - b If the shipper agrees to accept the receiver's data, the shipper will prepare a corrected copy of the shipping document using the receiver's data.
 - c If the results of the investigation are not satisfactory to both parties to the transfer, the Office of Safeguards and Security may be asked by either party to arbitrate the matter and determine the action to be taken.
- (5) Limits of Error on Transfers of Special Nuclear Material and Tritium. Department of Energy contractors shall determine and notify the Department of Energy of limits of error on all transfers of special nuclear material or tritium (except in the case of tritium in reservoirs). Such notification shall be by use of DOE/NRC Form 741 or DOE/NRC Form 741A. Limits of error shall be stated on copies of DOE/NRC Form 741 or DOE/NRC Form 741A submitted to the Department of Energy, but need not be stated on copies of the forms distributed to others. In cases where computer-generated equivalents of the forms are used, it shall be permissible to show the limits of error on all copies. The requirements for limits of error contained in DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80, or the Code of Federal Regulations, as appropriate, also apply.
- (6) Non-Department of Energy-owned americium-241, americium-243, curium, berkelium, and californium are not subject to the requirements of this Order.
- (7) Amendments or Adjustments to Previously Issued DOE/NRC Form 741 or DOE/NRC Form 741A. A shipper or receiver desiring to amend, adjust, or correct data previously documented on DOE/NRC Form 741 or DOE/NRC Form 741A shall do so according to guidance provided by the Office of Safeguards and Security.

- (8) Transfers of Nuclear Material between Department of Energy Contractors and Licensees.
- (a) Transfers to Licensees. Department of Energy cost-type contractors who receive authorizations and requests for distribution of nuclear material to a licensee, pursuant to 42 U.S.C. §§2073, 2093, and 2111 (as amended), shall document such transfers using DOE/NRC Form 741 or DOE/NRC Form 741A or their approved equivalents.
- (b) Transfers from Licensees. Transfer documents for nuclear material shipped to the Department of Energy for credit or service by a licensed facility shall be prepared and distributed by the shipper in accordance with the requirements of the Code of Federal Regulations. When such material is received it shall be documented by the receiver using DOE/NRC Form 741 and DOE/NRC Form 741A, or their approved equivalents.
- (9) Transfers of Nuclear Material Between the United States and Foreign Nations, Foreign Regional Organizations, or Supranational Organizations.
- (a) General. Foreign nations, foreign regional organizations, supranational organizations, or foreign facilities (hereafter referred to collectively as "foreign entities") may receive or return United States Government-owned or privately-owned nuclear material, as applicable, obtained by sale, lease, grant, donation, or loan from Department of Energy contractor facilities or United States Nuclear Regulatory Commission or "Agreement State" licensees, pursuant to 42 U.S.C. §§2074 (as amended), 2094 (as amended), 2112, and 2121(c).
- (b) Documentation of Transfers. Transfers of nuclear material to and from foreign entities shall be documented using DOE/NRC Form 741 and DOE/NRC Form 741A or their approved equivalents.
- (c) Preparation and Distribution of DOE/NRC Form 741 and DOE/NRC Form 741A. DOE/NRC Form 741 and DOE/NRC Form 741A documenting transfers to or from foreign entities shall be prepared and distributed according to guidance provided by the Office of Safeguards and Security.



William S. Heffelfinger
Director of Administration

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.4

1-6-81

SUBJECT: NUCLEAR MATERIALS BALANCE REPORT

1. PURPOSE. To establish policy and define procedures for periodic summaries and reports concerning material balances of nuclear material.
2. SCOPE. The provisions of this Order shall apply to all elements of the Department of Energy, its license-exempt contractors, to United States Nuclear Regulatory Commission and "Agreement State" licensees that are Department of Energy contractors, and to those facilities which have been assigned Reporting Identification Symbols beginning with the letter "V" which are Department of Energy contractor waste management sites.
3. BACKGROUND. This Order replaces Atomic Energy Commission Appendix 7401-C, Part III, MATERIAL STATUS REPORT.
4. REFERENCES.
 - a. DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80, contains the basic definitions, principles, and requirements for control and accountability of nuclear materials.
 - b. DOE 5630.3, DOCUMENTATION OF NUCLEAR MATERIAL TRANSACTIONS, of 1-6-81, contains the policies, procedures, and requirements for documentation by Department of Energy facilities of all nuclear material transactions.
 - c. DOE 5630.6, NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81, describes the procedures and requirements for preparation and submission of nuclear materials transaction, inventory, and material balance data to the Nuclear Materials Management and Safeguards System.
 - d. Code of Federal Regulations, Title 10--Energy, contains the regulations applicable to United States Nuclear Regulatory Commission and "Agreement State" licensees involved in activities concerning nuclear materials not subject to Department of Energy requirements.

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- e. Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, with Protocol, is a treaty between the United States and the International Atomic Energy Agency, which provides for the application of International Atomic Energy Agency safeguards to nuclear materials in certain selected facilities in the United States. Details of the specific safeguards requirements for specific facilities are contained in Facility Attachments or Transitional Facility Attachments negotiated pursuant to the Agreement. Copies of this document are available from the United States Government Printing Office.

5. DEFINITIONS.

- a. Reporting Identification Symbols are unique combinations of three or four letters which are assigned to each reporting facility for the purpose of identification in the nuclear materials management data base. Information relating to the construction and interpretation of Reporting Identification Symbols is contained in the "Directory of Reporting Identification Symbols" available from the Office of Safeguards and Security.
- b. Nuclear Materials Management and Safeguards System is the national data base and information support system for nuclear materials controlled by the United States Government, created to support national safeguards and management objectives in the domestic and foreign utilization of nuclear resources.

6. FORMS.

- a. DOE/NRC Form 742, "Material Balance Report," contains the information necessary to report material balances. An internal or computer-generated equivalent may be used in lieu of DOE/NRC Form 742 for reporting of material balance data. Any internal or computer-generated equivalent must contain all data necessary for proper reporting of material balances, and must be approved, prior to use, by the Office of Safeguards and Security.
- b. DOE Form DP-742B, "Material Activity Schedule," is used to report information on Department of Energy-owned leased special nuclear material held by a Department of Energy contractor for the account of another Reporting Identification Symbol.
- c. DOE/NRC Form 742 and DOE Form DP-742B (or their approved equivalents) shall be used to report the activities and material balances of Department of Energy field organizations and contractors. DOE/NRC Form 742 (or its approved equivalent) shall be used to report material balance data by all Department of Energy facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.

- d. DOE/NRC Form 742 and DOE Form DP-742B shall be designed so that the proper use of the forms will contribute to the overall safeguards control of nuclear material.

7. RESPONSIBILITIES AND AUTHORITIES.

a. Office of Safeguards and Security shall:

- (1) Establish policies, procedures, and standards affecting Department of Energy field organizations, contractors, and subcontractors. The policies, procedures, and standards established by the Office shall be comparable in their effectiveness to those of the United States Nuclear Regulatory Commission.
- (2) Review proposed internal or computer-generated equivalents of DOE/NRC Form 742 and DOE Form DP-742B, and, if the equivalents are found to contain all necessary data in the proper format, approve their use in lieu of DOE/NRC Form 742 and DOE Form DP-742B.

b. Heads of Field Organizations shall:

- (1) Require each contractor under their reporting jurisdiction to prepare and distribute a Material Balance Report (DOE/NRC Form 742 or approved equivalent) as follows:
 - (a) Monthly for each Department of Energy contractor operating Department of Energy production facilities under the jurisdiction of the Oak Ridge, Richland, Idaho, or Savannah River Operations Offices;
 - (b) Semiannually as of 3-31 and 9-30, for all other facilities; and,
 - (c) As specified in Facility Attachments or Transitional Facility Attachments for Department of Energy facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.
- (2) At their discretion request in lieu of the above that the Nuclear Materials Management and Safeguards System produce computer-generated Material Balance Reports. After receipt of all necessary data, such reports shall be sent promptly to the concerned facilities. The facilities shall review the reports for content, note thereon any changes that are warranted, and sign and distribute the reports.
- (3) Require that each contractor under their reporting jurisdiction, which has been notified of selection under the provisions of the

Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, prepare and submit subschedules to Material Balance Reports indicating the sources of receipts shown on Line 22 (From Other Materials) or the destinations of removals shown on Line 71 (Degradation to Other Materials) on the Material Balance Report.

8. PROCEDURES AND REQUIREMENTS.

- a. Material Balance Reports shall be submitted in the format of DOE/NRC Form 742 or approved equivalent.
- b. A single Material Balance Report shall be prepared for each material type to document the beginning and ending inventories and all receipts and removals of nuclear material relevant to the Reporting Identification Symbol being reported on by each facility. Inventory and transfer data shall be reported for all nuclear material, regardless of whether the material is held pursuant to a Department of Energy contract, under private ownership (except for non-Department of Energy-owned americium-241, americium-243, curium, berkelium, and californium), or under the provisions of 42 U.S.C. §§2073, 2074, 2093, or 2094 (as amended).
- c. Material in transit at the end of a reporting period shall be reported as if it had been received by the intended receiver.
- d. Material types, elements, and isotopes to be reported, and their respective reporting units, shall be as specified in Figure 1 of DOE 5630.3, DOCUMENTATION OF NUCLEAR MATERIAL TRANSACTIONS, of 1-6-81.
- e. Adjustments, amendments, or corrections to reports shall be made according to guidance provided by the Office of Safeguards and Security.
- f. Radioactive decay shall be reported on Material Balance Reports when the decay has been determined by the field organization to be significant.
- g. DOE Form DP-742B shall be submitted in addition to the Material Balance Report by facilities with Reporting Identification Symbols beginning with the letters "A" through "QAA," if applicable. DOE Form DP-742B shall be used for reporting information on Department of Energy-owned leased special nuclear material held for the account of another Reporting Identification Symbol.



William S. Heffelfinger
Director of Administration

U.S. Department of Energy

Washington, D.C.

ORDER

DOE 5630.5

1-6-81

SUBJECT: NUCLEAR MATERIALS INVENTORY REPORTING

1. PURPOSE. To establish policy and define procedures for reporting the status of nuclear materials held in inventory.
2. SCOPE. The provisions of this Order shall apply to all elements of the Department of Energy, its license-exempt contractors, to United States Nuclear Regulatory Commission and "Agreement State" licensees that are Department of Energy contractors, and to those facilities which have been assigned Reporting Identification Symbols beginning with the letter "V" which are Department of Energy contractor waste management sites.
3. BACKGROUND. This order replaces the inventory reporting provisions contained in Atomic Energy Commission Manual 7401.
4. REFERENCES.
 - a. DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 8-21-80, contains the basic definitions, principles, and requirements for control and accountability of nuclear materials.
 - b. DOE 5630.3, DOCUMENTATION OF NUCLEAR MATERIAL TRANSACTIONS, of 1-6-81, contains the policies, procedures, and requirements for documentation by Department of Energy facilities of all nuclear material transactions.
 - c. DOE 5630.6, NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81, describes the procedures and requirements for preparation and submission of nuclear materials transaction, inventory, and material balance data to the Nuclear Materials Management and Safeguards System.
 - d. Code of Federal Regulations, Title 10--Energy, contains the regulations applicable to United States Nuclear Regulatory Commission and "Agreement State" licensees involved in activities concerning nuclear materials not subject to Department of Energy requirements.

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- e. Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, with Protocol, is a treaty between the United States and the International Atomic Energy Agency, which provides for the application of International Atomic Energy Agency safeguards to nuclear materials in certain selected facilities in the United States. Details of the specific safeguards requirements for specific facilities are contained in Facility Attachments or Transitional Facility Attachments negotiated pursuant to the Agreement. Copies of this document are available from the United States Government Printing Office.

5. DEFINITIONS.

- a. Reporting Identification Symbols are unique combinations of three or four letters which are assigned to each reporting facility for the purpose of identification in the nuclear materials management data base. Information relating to the construction and interpretation of Reporting Identification Symbols is contained in the "Directory of Reporting Identification Symbols" available from the Office of Safeguards and Security.
- b. Status of Inventory is a reported breakdown of the physical or book inventory of a facility at a given time.
- c. Nuclear Materials Management and Safeguards System is the national data base and information support system for nuclear materials controlled by the United States Government, created to support national safeguards and management objectives in the domestic and foreign utilization of nuclear resources.

6. FORMS.

- a. DOE Form DP-733 and DOE Form DP-733A, "ADP Transcription Sheets for Inventory Data," contain information necessary for reporting of inventories of nuclear materials. The forms are identical except that Form DP-733A contains spaces for inventory data required only from facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America. An internal or computer-generated equivalent may be used for reporting of inventory data. Any such equivalent must contain all information necessary for proper reporting of nuclear materials inventories, and must be approved, prior to use, by the Office of Safeguards and Security.
- (1) DOE Form DP-733 (or an approved equivalent) shall be used to report the status of inventory of all Department of Energy field organizations and Department of Energy contractors.

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- (2) DOE Form DP-733A or DOE/NRC Form 742C (or an approved equivalent) shall be used in lieu of DOE Form DP-733 by Department of Energy facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.
- b. DOE/NRC Form 742C, "Physical Inventory Listing," contains information necessary for reporting of nuclear materials inventories. DOE/NRC Form 742C contains essentially the same information as DOE Form DP-733A, and may be used in lieu of DOE Form DP-733A. All policies, procedures, and requirements applicable to DOE Form DP-733A also shall apply to DOE/NRC Form 742C.
- c. The reporting forms shall be designed so that the proper use of the forms will contribute to the overall safeguards control of nuclear materials. Data on these forms shall be reported to the Nuclear Materials Management and Safeguards System according to the provisions of DOE 5630.6, NUCLEAR MATERIALS DATA PROCESSING PROCEDURES, of 1-6-81.

7. RESPONSIBILITIES AND AUTHORITIES.

a. Office of Safeguards and Security shall:

- (1) Establish inventory reporting policies, procedures, and standards affecting Department of Energy field organizations, Department of Energy contractors, and Department of Energy subcontractors. The Office shall assure that the policies, procedures, and standards established are comparable in their effectiveness to those adopted by the United States Nuclear Regulatory Commission.
- (2) Review proposed equivalents to DOE Form DP-733, DOE Form DP-733A, and DOE/NRC Form 742C, and, if the equivalents are found to contain all necessary data in the proper format, approve their use in lieu of the designated forms.

b. Heads of Field Organizations shall:

- (1) Require contractors under their reporting jurisdiction to prepare and submit inventory data to the Nuclear Materials Management and Safeguards System.
- (2) Require inventory data or reports necessary for their own use from contractors under their reporting jurisdiction.

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- c. Manager, Albuquerque Operations Office, in addition to the requirements specified in paragraph 7b, shall:
- (1) Report inventory data on nuclear material transferred to the Department of Defense under 42 U.S.C. §2121(b), as amended, with the exception of material specified in paragraph 7d below, to be reported by the Pittsburgh Naval Reactors Office.
 - (2) Report inventory data on material transferred to a foreign nation under 42 U.S.C. §2121(c), as amended.
- d. Manager, Pittsburgh Naval Reactors Office, in addition to the requirements of paragraph 7b, shall report inventory data on material transferred to the Department of Defense for nonweapons Naval reactor programs under 42 U.S.C. §2121(b), as amended.

8. PROCEDURES AND REQUIREMENTS.

a. General.

- (1) All inventories of special nuclear material, source material, and certain other nuclear materials (see paragraph 8b, below) shall be reported on DOE Form DP-733, DOE Form DP-733A, or DOE/NRC Form 742C, or their approved equivalents, as appropriate.
- (2) Inventory reports shall be prepared and distributed according to guidance provided by the Office of Safeguards and Security.
- (3) Inventory reports shall be submitted:
 - (a) Monthly for each Department of Energy contractor operating Department of Energy production facilities under the reporting jurisdiction of the Oak Ridge, Richland, Idaho, or Savannah River Operations Offices;
 - (b) Quarterly, as of 12-31, 3-31, 6-30, and 9-30 for all other facilities; and,
 - (c) As specified in Facility Attachments or Transitional Facility Attachments for Department of Energy facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.

- b. Material Types, Elements, and Isotopes to be reported, and their respective reporting limits, shall be as specified in Figure 1 of DOE 5630. , DOCUMENT/ OF NUCLEAR MATERIALS TRANSACTIONS, of - - . Non-Department of energy-owned americium-241, americium-243, curium, berkelium, and californium are not subject to the provisions of this Order.
- c. Material shipped domestically which is in transit at the end of a reporting period shall be reported as if it had been received by the intended receiver.



William S. Heffelfinger
Director of Administration

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.6

1-6-81

SUBJECT: NUCLEAR MATERIALS DATA PROCESSING PROCEDURES

1. PURPOSE. To establish policy and define procedures for reporting nuclear materials transaction, material balance, and inventory data to the Nuclear Materials Management and Safeguards System.
2. SCOPE. The provisions of this Order shall apply to all elements of the Department of Energy, its license-exempt contractors, to United States Nuclear Regulatory Commission and "Agreement State" licensees that are Department of Energy contractors, and to those facilities which have been assigned Reporting Identification Symbols beginning with the letter "V" which are Department of Energy contractor waste management sites.
3. REFERENCE. "Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, with Protocol," is a treaty between the United States and the International Atomic Energy Agency which provides for the application of International Atomic Energy Agency safeguards to nuclear materials in certain selected facilities in the United States. Details of the specific safeguards requirements for specific facilities are contained in Facility Attachments or Transitional Facility Attachments negotiated pursuant to the Agreement. Copies of this document are available from the United States Government Printing Office.
4. DEFINITIONS.
 - a. Nuclear Materials Management and Safeguards System. The national data base and information support system for nuclear materials controlled by the United States Government, created to support national safeguards and management objectives in the domestic and foreign utilization of nuclear resources. The system stores data on nuclear material transactions and inventories, and produces a wide range of printed reports for use by the Department of Energy, the United States Nuclear Regulatory Commission, other United States Government agencies, State and local governments, and the general public. The system is used to satisfy the nuclear materials information requirements of agreements between the United States and foreign entities. In addition, the system provides the reporting interface between facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, and the International Atomic

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Energy Agency. The system uses a centralized computer data base linked via direct data communication lines and the Secure Automated Communications Network to a number of facilities, Department of Energy offices, and United States Nuclear Regulatory Commission offices in the United States.

- b. Reporting Identification Symbols. Unique combinations of three or four letters which are assigned to each reporting facility for the purpose of identification in the nuclear materials management data base. Information relating to the construction and interpretation of Reporting Identification Symbols is contained in the "Directory of Reporting Identification Symbols" available from the Office of Safeguards and Security.

5. POLICY AND OBJECTIVES.

- a. The Nuclear Materials Management and Safeguards System shall be used to accumulate and distribute information concerning nuclear materials inventories and transfers. The objective of the system is to achieve reporting of accurate and complete data as soon as possible after the events described by the data occur.
- b. The system shall provide information relating to safeguards, materials management, production, and financial accounting of nuclear materials as requested or required by the Department of Energy or the United States Nuclear Regulatory Commission.
- c. In addition, the system shall serve as the centralized reporting facility to provide the information required under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.

6. FORMS.

- a. DOE Form DP-733 and DOE Form DP-733A, ADP Transcription Sheets for Inventory Data, contain information necessary for reporting of inventories of nuclear materials in the format required for input to the Nuclear Materials Management and Safeguards System. The forms are identical except that Form DP-733A contains spaces for inventory data required only from facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.
- b. DOE Form DP-734, ADP Transcription Sheet for Concise Notes, contains all information necessary for reporting of "Concise Note" data, in the format required for input to the Nuclear Materials Management and

Safeguards System. "Concise Notes" are submitted only by facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America.

- c. DOE Form DP-735, ADP Transcription Sheet for MBR Data, contains all information necessary for reporting of material balance data, in the format required for input to the Nuclear Materials Management and Safeguards System.
- d. DOE Form DP-740, ADP Transcription Sheet, Nuclear Material Transaction Journal, and DOE Form DP-740A, ADP Transcription Continuation Sheet, Nuclear Material Transaction Journal, together contain all information necessary for reporting of nuclear materials transactions, in the format required for input to the Nuclear Materials Management and Safeguards System. DOE Form DP-740 is used also for data on confirmatory measurements reported on Form DOE-284.
- e. DOE Form DP-749, ADP Transcription Sheet, Internal Project Transfers, contains all information necessary for reporting of transfers of nuclear material between Department of Energy projects or programs under the same Reporting Identification Symbol, in the format required for input to the Nuclear Materials Management and Safeguards System.

7. RESPONSIBILITIES AND AUTHORITIES.

a. The Director of Safeguards and Security shall:

- (1) Manage the development and maintenance of the Nuclear Materials Management and Safeguards System for the purposes of:
 - (a) Collecting and processing data on nuclear materials for which the United States has a safeguards or management interest, both domestically and internationally;
 - (b) Issuing reports for the Department of Energy, the United States Nuclear Regulatory Commission, and other United States Government organizations; and
 - (c) Maintaining historical records of nuclear material transactions and inventories in support of safeguards and other programs of the United States Government.
- (2) Assure that the data collection policies, procedures, and standards of the Department of Energy are comparable in their effectiveness to those of the United States Nuclear Regulatory Commission.

- (3) Review proposed methods for submission of nuclear materials data to the Nuclear Materials Management and Safeguards System by use of telecommunications systems, and, if the proposed methods satisfy all applicable requirements, approve their use in lieu of the forms defined in paragraph 6.
- b. Heads of Field Organizations shall require each contractor under their reporting jurisdiction to:
- (1) Provide data to the Nuclear Materials Management and Safeguards System.
 - (2) Provide both shipper's and receiver's transaction data to the Nuclear Materials Management and Safeguards System in those cases where the shipper or receiver is a foreign entity.
 - (3) Provide review of Nuclear Materials Management and Safeguards System output sufficient to verify data processed by the system.

8. PROCEDURES AND REQUIREMENTS.

- a. Transaction Data. Data on nuclear materials transactions should be submitted to the Nuclear Materials Management and Safeguards System, using DOE Form DP-740 and DOE Form DP-740A, as soon as possible after the transaction occurs, but no less often than weekly. Data on all transactions occurring during a calendar month shall be submitted no later than the 10th calendar day following the end of the month during which the transactions occurred.
- b. Inventory Data. Data on nuclear materials inventories shall be submitted to the Nuclear Materials Management and Safeguards System using DOE Form DP-733, or, for the facilities selected under the provisions of the Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States of America, using DOE Form DP-733A. Inventory data shall be submitted within 15 days of the end of the reporting period.
- c. Material Balance Data. In any case where material balance data are required to be submitted to the Nuclear Materials Management and Safeguards System, the data shall be submitted, using DOE Form DP-735, within 15 days of the end of the reporting period.
- d. Concise Note Data. "Concise Note" data shall be submitted to the Nuclear Materials Management and Safeguards System, using DOE Form DP-734, at the same time as the submission of the data to which the "Concise Note" refers.

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- e. Inventory Difference Explanation Data. Data explaining the reasons for reported inventory differences shall be submitted to the Nuclear Materials Management and Safeguards System, using DOE Form DP-740, as soon as possible after the explanation data are available, but no later than 10 days after reporting of the inventory difference.
- f. Internal Project Transfer Data. Internal (within one Reporting Identification Symbol) project transfer data shall be submitted to the Nuclear Materials Management and Safeguards System, using DOE Form DP-749, no later than the 10th calendar day following the end of the month in which the transfer occurs.
- g. Confirmatory Measurement Data. Data on confirmatory measurements reported on Form DOE-284 shall be submitted to the Nuclear Materials Management and Safeguards System, using DOE Form DP-740, as soon as possible after receipt of the material, but no less often than weekly. Data on confirmatory measurements on all transfers occurring during a calendar month shall be submitted no later than the 10th calendar day following the end of the month during which the transfers occurred.
- h. Alternative Data Submission Methods.
 - (1) Machine-readable Data. In lieu of the forms specified in paragraphs 8a-g, data may be submitted to the Nuclear Materials Management and Safeguards System in machine-readable form (e.g., on punched cards or magnetic tape). Information submitted in machine-readable form shall include all data which appear on the appropriate form specified in paragraphs 8a-g, and shall be in the format specified for that form by the Office of Safeguards and Security.
 - (2) Use of Telecommunications. With prior approval of the Office of Safeguards and Security, data may be submitted directly via telecommunications systems to the Nuclear Materials Management and Safeguards System in lieu of using the forms specified in paragraphs 8a-g. Information submitted via telecommunications shall include all data required on the appropriate forms specified in paragraphs 8a-g, and shall be in the format specified by the Office of Safeguards and Security.
 - (3) In any case where data are submitted in machine-readable form or via telecommunications, the timing requirements of paragraphs 8a-g shall apply, as appropriate for the type of data submitted.

- i. Correction Data. Data correcting previously submitted data found to be in error shall be submitted during the workday in which notification of the error is received.



William S. Heffelfinger
Director of Administration

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5630.7

7-8-81

SUBJECT: CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS SURVEYS

1. PURPOSE. To specify the requirements for Department of Energy (DOE) nuclear material control and accountability surveys.
2. SCOPE. The provisions of this Order apply to all elements of the DOE and its contractors and subcontractors who may possess, use, or ship nuclear material. This Order applies to Government-owned and contractor-operated nuclear facilities, Government-owned and Government-operated nuclear facilities, and to DOE-owned nuclear material at licensed facilities where nuclear materials surveys for the control and accountability of the material are not performed by the Nuclear Regulatory Commission (NRC).
3. BACKGROUND. This Order replaces Atomic Energy Commission (AEC) 7401, Appendix A, "Safeguards Control and Management of Nuclear Materials, Surveys, Inspections, and Reviews," of 8-12-70.
4. POLICY. It is the policy of the DOE that the possession, use, and production of nuclear materials shall be controlled and accounted for consistent with the common defense, security and national welfare of the United States. One of the major elements of this control program is achieved by the Department of Energy conducting surveys periodically and monitoring certain data on a continuing basis to assure that contractors effectively control and account for the nuclear material entrusted to their care and to assure that these contractors actually have all the nuclear material reported to be in their possession.
5. DEFINITIONS.
 - a. B. The probability of not detecting at least one defect if an amount of material, equal to the goal quantity (GQ), is missing from the inventory.
 - b. Level I Assurance. Assurance that the nuclear material control and accountability measures in place and required are adequate against the defined threat.
 - c. Level II Assurance. Assurance that the inherent capability is satisfactorily used.
 - d. Level III Assurance. Assurance, at any organizational level, that the nuclear material control and accountability measures at a lower organizational level have been effective.

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Office of Safeguards and
Security

- e. Nuclear Materials Survey. A comprehensive examination and evaluation of the effectiveness of the material control and accountability of nuclear materials at DOE contractor facilities.
 - f. Additional terms are defined in DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, of 3-21-80.
6. RESPONSIBILITIES AND AUTHORITIES.
- a. Director of Safeguards and Security.
 - (1) Develops Departmentwide policies, procedures, and standards for conducting nuclear material control and accountability surveys.
 - (2) Periodically reviews and evaluates the degree of adherence by each Operations Office to DOE policies and procedures concerning the content and conduct of surveys as well as the Nuclear Materials Management and Safeguards Systems procedures, data, and documents which support each Operations Office's consolidated nuclear materials records and reports.
 - (3) Reviews nuclear materials survey reports submitted by each Operations Office.
 - (4) Advises cognizant Headquarters program organizations of any significant problems identified as a result of the periodic reviews of Operations Office activities and review of nuclear materials survey reports, and recommend appropriate measures to correct the noted deficiencies.
 - (5) Approves exceptions to the provisions of this Order.
 - b. Managers of Operations Offices.
 - (1) Prior to the initiation of any action involving nuclear materials with a license-exempt contractor, assure that appropriate contractual coverage is in place to permit the implementation of this Order with regard to the contractor's nuclear materials activities.
 - (2) Develop detailed procedures for conducting nuclear materials control and accountability surveys in accordance with this Order.
 - (3) Schedule and conduct nuclear materials surveys of each license-exempt contractor under their jurisdiction.
 - (4) Schedule and conduct nuclear materials surveys of DOE-owned nuclear materials at licensed facilities where the NRC does not exercise survey or inspection responsibility.
 - (5) Take such actions as may be necessary to correct deficiencies disclosed during a survey.

- (6) Provide the Office of Safeguards and Security and the appropriate Headquarters program organization with a copy of the survey report. The report should identify significant deficiencies and proposed corrective measures.
 - (7) Retain, in a form suitable for use and review, workpapers generated during the nuclear materials survey.
- c. Heads of Procuring Activities (other than Managers of Operations Offices).
- (1) Prior to the initiation of any action involving nuclear materials with a license-exempt contractor, assure that appropriate contractual coverage is in place to permit the implementation of this Order with regard to the contractor's nuclear materials activities
 - (2) Notify the Office of Safeguards and Security prior to awarding a contract involving nuclear material for appropriate coordination of effort to assure that the Office of Safeguards and Security or an Operations Office assumes the appropriate responsibilities and provides the necessary assistance to all parties.

7. REQUIREMENTS AND PROCEDURES.

- a. Nuclear materials surveys of each license-exempt contractor facility shall be performed annually for Category IA, IB, II, and III materials, and biennially for Category IV nuclear materials, as defined in DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES, unless:
- (1) The total value of the nuclear material inventory at any time does not exceed \$150,000 and the value of nuclear material receipts for any 12-month period is less than \$500,000;
 - (2) The total inventory consists entirely of source material, less than 10 tons of heavy water, less than 350 grams of special nuclear material (SNM), or any combination of these; or
 - (3) Specific approval is obtained from the Director of Safeguards and Security.
- b. Surveys of contractor facilities meeting the criteria in subparagraphs a(1) and a(2), above, shall be conducted at the discretion of the Operations Office Manager.
- c. During nuclear materials surveys, DOE personnel shall, as appropriate for the type and quantity of nuclear material in the inventory:
- (1) Review and evaluate: (a) the measurements and statistical programs, (b) internal control system, and (c) the material control and accountability plan;

- (2) Ascertain facility compliance with the written procedures and the objectives of DOE directives on control and accountability of nuclear materials and the material control and accountability plan;
- (3) Review and evaluate the cause, magnitude, reasonableness, and disposition of accidental losses, normal operational losses/measured discards, approved writeoffs, inventory differences, and shipper-receiver differences;
- (4) Audit the nuclear material records and reports to verify the accuracy of the facility's material status reports and the subsidiary records; and
- (5) Observe the inventory procedures and practices and control the independent tests of the inventory to confirm the facility's statement of the quantity of material on hand. Where feasible, verification of the inventory shall include verification of the inventory listing and tests of the inventory in accordance with Figure 1. The extent of inventory testing required will also depend on, but not necessarily be limited to, such considerations as the facility's: (a) internal control, (b) known or suspected problems, (c) prior survey findings, (d) physical protection, and (e) tamper-indicating devices. Operations Offices may develop and use statistically valid sampling plans appropriate for their site-specific needs. Tests of the inventory based on valid statistical sampling plans shall be conducted to establish that stated nuclear material quantities are accurate. Inventory testing will be based on a graded safeguards concept, and documentation shall be maintained to support the survey team's inventory testing criteria, sampling plans, test results, and conclusions. Efforts should be made in production and/or processing operations, and particularly in storage accounts to strive for inventory stratification and verification which will allow conclusions that goal quantities consistent with Figure 1, are not missing from the inventory, and leading to a demonstrable Level III independent assurance. Inventory exemptions for highly radioactive material are as contained in DOE 5630.2, CONTROL AND ACCOUNTABILITY OF NUCLEAR MATERIALS, BASIC PRINCIPLES. See comment number 2 of Figure 3, page II-5, and paragraph 6, page II-12. Inventory verification of nuclear materials not shown in Figure 1 on the following page shall be conducted where necessary to assure adequate accountability consistent with the operational needs and the intrinsic value of these materials.

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Material Type	Enrichment	Concentration	Material Form	Goal Quantity (Kg)
U-233		< 10%	Compounds	
		> 10%	Metal, Oxides, Carbides	2
		> 40%	Fluorides, Mixed Oxides, Mixed Carbides	2
		10-40%	Fluorides, Mixed Oxides, Mixed Carbides	10
U-235	0.711 to 20%	> 20%	All Forms	50
		> 30%	Metal	5
		20-30%	Oxides and Carbides	5
		> 50%	Oxides and Carbides	25
		20-50%	All Other Compounds	5
			All Other Compounds	25
Pu-238			All Forms	2
Pu-239/Pu-241			Metal, Oxides, Carbides, Nitrates	2
Pu-239		> 10%	Alloys, Mixed Oxides	2
		< 10%	Alloys, Mixed Oxides	10

The value of β shall be equal to or less than 0.2 for attribute tests and equal to or less than 0.5 for variables tests. Where reduced testing is warranted, the value of β may be adjusted accordingly, or an alternative sampling plan may be used. The justification for such an adjustment or alternative sampling plan shall be documented.

Figure 1
Inventory Verification Criteria for Nuclear Materials



William S. Heffelfinger
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