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LICENSED FUEL FACILITY STATUS REPORT

INVENTORY DIFFERENCE DATA
JANUARY 1985 - JUNE 1985

UNITED STATES NUCLEAR REGULATORY COMMISSION

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OFFICE OF INSPECTION AND ENFORCEMENT
U.S. NUCLEAR REGULATORY COMMISSION
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ABSTRACT

NRC is committed to the periodic publication of licensed fuel facilities' inventory difference data, following agency review of the information and completion of any related investigations. Information in this report includes inventory difference data for active fuel fabrication facilities possessing more than one effective kilogram of high enriched uranium, low enriched uranium, plutonium, or uranium-233.

CONTENTS

ABBREVIATIONS

CFR	Code of Federal Regulations
HEU	high enriched uranium
ID	inventory difference
LEID	limit of error of the inventory difference
LEU	low enriched uranium
MUF	material unaccounted for
NRC	U.S. Nuclear Regulatory Commission
Pu	plutonium
SNM	special nuclear material
S-R	shipper-receiver
U-235	uranium-235

LICENSED FUEL FACILITY STATUS REPORT
INVENTORY DIFFERENCE DATA

Inventory Difference Data

An inventory difference (ID), also referred to as material unaccounted for (MUF), is the difference between the quantity of special nuclear material (SNM) that a licensee's accounting records show should be on hand and that which a licensee's physical inventory shows is actually on hand.

The ID data presented are for active, licensed facilities that are authorized to possess, in an unsealed form, at least one effective kilogram of special nuclear material (that is, high enriched uranium (HEU), plutonium, and uranium-233) or at least one effective kilogram of low enriched uranium (LEU). For example, LEU is the nuclear fuel used in commercial light-water nuclear power reactors. The U.S. Nuclear Regulatory Commission (NRC) requires licensees possessing significant quantities of HEU, plutonium, or uranium-233 to conduct an inventory every 2 months. Licensees possessing one effective kilogram of low enriched uranium are required to inventory every 6 months, except for General Electric Co., Wilmington, NC, which is required to inventory every 12 months.

It is important to understand the distinction between the low strategic significance of LEU and the higher strategic significance of HEU and plutonium. Most LEU is enriched to a level of 1 to 4 percent in the isotope uranium-235. At this level of enrichment, the uranium is not capable of sustaining the kind of nuclear reaction that takes place in a nuclear explosion.

NRC safeguards requirements covering LEU are graded to reflect its low strategic significance. They include a formal structured system for material control and accounting and minimal physical security measures. On the other hand, because of the higher strategic significance of HEU and plutonium, NRC requires licensees to provide substantial physical protection of this material in addition to controlling and accounting for it. Physical protection of this material includes safeguards measures such as barriers, intrusion alarms, armed guards, and offsite police response capabilities. Internal systems to control the movement of HEU are also required by NRC.

IDs arise when nuclear materials are processed, particularly when chemical operations are involved. These differences can result from variations in measuring and processing, measurement inaccuracy or imprecision, unmeasured flows from the process, unmeasured inventory, bookkeeping errors, or loss or theft. Although an ID larger than its overall measurement uncertainty may signal an abnormal situation requiring determination of the cause, the fact that an ID falls within its associated limit of error--even an ID of zero--provides no automatic or conclusive proof that loss or theft of material has not occurred. Therefore, NRC relies on information provided not only by the material accounting system but also by the internal control system, the physical security system, NRC inspections and evaluations, and NRC and licensee investigations.

The concept of the limit of error of the inventory difference (LEID) is a method that licensees and NRC currently use to determine the significance of the ID. LEID is a calculated estimate of the measurement uncertainties that are associated with a plant's processing activity. The ID should be less than the LEID 19 out of 20 times, if the ID results only from measurement uncertainty.

Because an ID that exceeds its associated LEID may be an indication of processing problems, biased or otherwise inaccurate measurements, bookkeeping errors, or loss or theft of material, NRC accordingly requires licensees to take increasingly stronger investigative actions depending on how much the inventory difference exceeds both LEID and minimum quantities specified in 10 CFR §74.13(b), (namely, 200 grams of Pu, 300 grams of U-235 contained in HEU, or 9,000 grams of U-235 contained in LEU). If the ID exceeds its LEID, but does not exceed the minimum quantities, no formal investigation is required. However, the licensee is required to try to determine why the ID exceeded the LEID.

The IDs for this reporting period (January 1 through June 30, 1985) are indicated in the Tabulation of Inventory Differences that begins on page 5 of this report. An explanation of the significance, and in some cases, the source of the IDs is included in the last column of the table. None of the IDs was such as to require an NRC investigation.

Definitions of Terms

1. Special nuclear material (SNM): (1) Plutonium, uranium-233, uranium enriched in the isotope 235, and any other material that the Commission, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954, as amended, determined to be special nuclear material, but does not include source material; or (2) any material artificially enriched in any of the foregoing, but does not include source material.

2. Source material: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) uranium, (ii) thorium, or (iii) any combination thereof. Source material does not include special nuclear material.

3. Effective kilogram of special nuclear material: (1) For plutonium and uranium-233, their weight in kilograms; (2) for uranium with an enrichment in the isotope uranium-235 of 0.01 (1%) and above, its element weight in kilograms multiplied by the square of its enrichment expressed as a decimal weight fraction; and (3) for uranium with an enrichment in the isotope uranium-235 below 0.01 (1%), its element weight in kilograms multiplied by 0.0001.

4. Strategic special nuclear material: Uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium.

5. Isotope: One of two or more atoms with the same number of protons, but different numbers of neutrons in their nuclei.

6. High enriched uranium (HEU): Uranium whose isotope content is 20 percent or more uranium-235 by weight.

7. Low enriched uranium (LEU): Uranium whose isotope content is less than 20 percent uranium-235 by weight.

8. Inventory difference (ID): The arithmetic difference between a book inventory and the corresponding physical inventory, calculated by subtracting ending inventory (EI) plus removals (R) from beginning inventory (BI) plus additions (A). Mathematically, this becomes

$$ID = (BI + A) - (EI + R).$$

9. Limit of error: The uncertainty component used in constructing a 95 percent confidence interval associated with a quantity after any recognized bias has been eliminated or its effect accounted for.

10. Limit of error of the inventory difference (LEID): That limit of error associated with the inventory difference after the material balance data have been adjusted for any recognized bias.

11. "The inventory difference falls within the applicable regulatory limit": The ID does not exceed 1.5 times any applicable LEID limits specified in 10 CFR 70.51(e)(5) or other LEID limits approved by the NRC under 10 CFR 70.51(e)(6).

12. Negative inventory difference: A situation that occurs when the amount of material on hand, as determined by physical inventory, exceeds the amount of material being carried on the books (that is, there appears to be a gain of material). Mathematically, a negative ID is written as -ID or is shown in parentheses. A negative ID is also referred to as an "ID gain."

13. Positive inventory difference: A situation that occurs when the amount of material on hand, as determined by physical inventory, is less than the amount of material being carried on the books (that is, there appears to be a loss of material). Mathematically, a positive ID is written as +ID or ID (without designation of sign). A positive ID is also referred to as an "ID loss."

14. Shipper-receiver difference (S-R difference): The arithmetic difference between the quantity of special nuclear material measured by the shipper and the quantity measured by the receiver.

Tabulation of Inventory Differences

Licensee	Licensee No. SNM-	Material Type	Inventory Date	Inventory Difference (Grams of U-235 or Pu)	Explanation
Babcock & Wilcox, Naval Nuclear Fuel Div., Lynchburg, VA	42	HEU	1/5/85	-265	The inventory difference falls within the applicable regulatory limit.
		HEU	3/2/85	-462	The inventory difference falls within the applicable regulatory limit.
		HEU	4/22/85	1,994	The inventory difference exceeded the limit of error. An investigation was performed by the licensee and the cause of the ID could not be determined.
		HEU	6/29/85	114	The inventory difference falls within the applicable regulatory limit.
Babcock & Wilcox, Lynchburg Research Center, Lynchburg, VA	778	HEU	4/19/85	20	The inventory difference falls within the applicable regulatory limit.
		Pu	4/19/85	19	The inventory difference falls within the applicable regulatory limit.
Babcock & Wilcox, Commercial Nuclear Fuel Plant, Lynchburg, VA	1168	LEU	2/22/85	995	The inventory difference falls within the applicable regulatory limit.

Licensee	Licensee No. SNM -	Materia Type	Inventory Date	Inventory Difference Grams of U-235 or Pu)	Explanation
Cintichem, Inc. Tuxedo, NY	639	HEU	1/4/85	15	The inventory difference falls within the applicable regulatory limit.
		HEU	3/5/85	9	The inventory difference falls within the applicable regulatory limit.
		HEU	5/1/85	-6	The inventory difference falls within the applicable regulatory limit.
Combustion Engineering, Hematite, MO	33	LEU	-	-	No inventory was conducted during the reporting period.
Combustion Engineering, Windsor, CT	1067	LEU	3/19/85	3,252	The inventory difference falls within the applicable regulatory limit.
Exxon Nuclear Co., Richland, WA	1227	LEU	2/28/85	-6,753	The inventory difference falls within the applicable regulatory limit.
GA Technologies, La Jolla, CA	696	HEU	1/14/85	-106	The inventory difference falls within the applicable regulatory limit.
		HEU	3/18/85	-122	The inventory difference falls within the applicable regulatory limit.
		LEU	3/18/85	-13	The inventory difference falls within the applicable regulatory limit.
		HEU	5/20/85	-282	The inventory difference falls within the applicable regulatory limit.

Licensee	Licensee No. SNM-	Material Type	Inventory Date	Inventory Difference (Grams of U-235 or Pu)	Explanation
General Electric, Wilmington, NC	1097	LEU	N/A	N/A	No inventory was conducted during the reporting period.
Nuclear Fuel Services, Erwin, TN	124	HEU	2/28/85	2,110	The inventory difference exceeded the limit of error. An investigation was performed by the licensee and the cause of the ID could not be determined.*
		LEU	5/3/85	-256	The inventory difference falls within the applicable regulatory limit.
		HEU	5/15/85	-2,277	The inventory difference exceeded the limit of error. An investigation was performed by the licensee and the cause of the ID could not be determined.*
Rockwell, ESG, Santa Susana, CA	21	Pu	1/31/85	-4	The inventory difference falls within the applicable regulatory limit.
		Pu	4/1/85	-2	The inventory difference falls within the applicable regulatory limit.
		Pu	6/3/85	-5	The inventory difference falls within the applicable regulatory limit.
		HEU	6/3/85	-3	The inventory difference falls within the applicable regulatory limit.

* Although the licensee could not determine the cause of the two IDs exceeding their associated LEIDs, it should be noted that the combined ID for the two periods was a gain of 167 grams U-235 which would be within the combined LEID if such a value were calculated. Also, the cumulative ID for the period April 20, 1983, through May 15, 1985, was a gain of 123 grams U-235. This gain includes a gain of 1975 grams U-235 reported by the licensee following the November 2, 1984, physical inventory which was attributed to prior periods.

Licensee	Licensee No. SNM-	Material Type	Inventory Date	Inventory Difference (Grams of U-235 or Pu)	Explanation
United Nuclear Corp., Montville, CT	368	HEU	1/11/85	2,853	The inventory difference exceeded the limit of error. This loss occurred primarily because of corrections resulting from reanalysis of data from prior reporting periods.
		HEU	3/15/85	-1,521	The inventory difference exceeded the limit of error. This gain resulted primarily from a reinventory of material located in the scrap storage room.
		HEU	5/17/85	-627	The inventory difference exceeded the limit of error. This gain resulted primarily from four items that were inventoried on 3/15/85 for which the licensee inadvertently failed to include the uranium-235 values for the physical inventory.
Westinghouse, Columbia, SC	1107	LEU	1/2/85	22,284	The inventory difference falls within the applicable regulatory limit.

NRC FORM 335 (2-84) NRCM 1102, 3201, 3202

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