

NUREG-0430
Vol. 2, No. 1

LICENSED FUEL FACILITY STATUS REPORT

INVENTORY DIFFERENCE DATA
JANUARY 1981 - JUNE 1981

UNITED STATES NUCLEAR REGULATORY COMMISSION



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Washington, D. C. 20555

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Manuscript Completed: April 1982
Date Published: July 1982

OFFICE OF INSPECTION AND ENFORCEMENT
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555



ABSTRACT

NRC is committed to the periodic release of inventory difference data from the licensed fuel facilities after the agency has had an opportunity to review the data and has performed any related investigations associated with the data. Information included 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.

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ABBREVIATIONS

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

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 what a licensee's accounting records show should be on hand and what a licensee's physical inventory shows is actually on hand.

The inventory difference 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, plutonium, and uranium-233) or at least one effective kilogram of low enriched uranium (for example, material used in commercial nuclear power reactors). The U. S. Nuclear Regulatory Commission (NRC) requires licensees possessing significant quantities of high enriched uranium, 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, N.C., which is required to perform an inventory every 12 months.

It is important to understand the distinction between the low strategic value of low enriched uranium and the higher strategic value of high enriched uranium and plutonium. Most low enriched uranium (the nuclear fuel for commercial light-water power reactors) 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 low enriched uranium are graded to reflect its low strategic value. They include a formal structured system for material control and accounting and, in accordance with recent revisions to 10 CFR 73, minimal physical security measures. On the other hand, because of the higher strategic importance of significant quantities of high enriched uranium 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 this nuclear material are also required by NRC.

Inventory differences 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 inventory difference larger than its overall measurement uncertainty (limit of error) may signal an abnormal situation

requiring determination of cause, the fact that an inventory difference falls within its associated limit of error--even an inventory difference 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.

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

Because an inventory difference 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 LEID. Several inventory differences exceeded their LEID during the period of this report (January 1, 1981 through June 30, 1981). In each case that the inventory difference exceeded the criteria of 10 CFR 70.53(b)(1), the licensee forwarded to NRC a statement of the probable reasons for the ID and the actions taken or planned with respect to the ID. Each such statement has been reviewed by NRC. In certain instances in the past, NRC has independently conducted investigations of an excessive ID. These investigations have not established that significant quantities of special nuclear material have been stolen. For each inventory difference noted in this report, there is an evaluation of the data and, where appropriate, the cause or causes of the inventory difference have been identified.

Definitions of Terms

1. 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.
2. High Enriched Uranium (HEU): Uranium whose isotope content is 20 percent or more uranium-235 by weight.
3. Inventory Difference (ID): The arithmetic difference between the book and physical inventories, calculated by subtracting ending inventory (EI) plus removals (R) from beginning inventory (BI) plus additions (A). Mathematically, this becomes

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

4. Isotope: One of several different atoms of a particular element, that has the same number of protons in its nucleus, has the same atomic number, but differs in the number of neutrons and in the mass number.
5. 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.
6. Limit of Error of the Inventory Difference (LEID): That limit of error associated with the inventory difference after the material balance data has been adjusted for any recognized bias (same as limit of error of material unaccounted for [LEMUF]).
7. "The inventory difference is within the regulatory limit": The ID does not exceed both a minimum quantity specified by the regulations and its associated limit of error of the inventory difference (LEID).
8. Low Enriched Uranium (LEU): Uranium whose isotope content is less than 20 percent uranium-235 by weight.
9. Negative Inventory Difference: 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. A negative ID is also referred to as an "ID gain."

10. Positive Inventory Difference: 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".
11. 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.
12. Special Nuclear Material (SNM): (1) Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the Commission, pursuant to the provisions of Section 51 of the Act, determined to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.
13. Strategic Special Nuclear Material: Uranium-235 (contained in uranium enriched to 20 percent or more in the U-235 isotope), uranium-233, or plutonium.

Tabulation of Inventory Differences

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
Babcock & Wilcox - Navy, Lynchburg, VA	SNM-42	HEU	02/28/81	1,425	The licensee investigation identified the following contributions: 170 grams, weighing errors; 176 grams, prior period overstatement. Licensee sampling studies indicate that liquid effluents may be understated because of measurement bias.
		HEU	04/30/81	170	The inventory difference falls within the regulatory limit.
		HEU	06/30/81	214	The inventory difference falls within the regulatory limit.
Babcock & Wilcox, Apollo, PA	SNM-145	LEU	06/12/81	6,728	The inventory difference falls within the regulatory limit.
		HEU	02/17/81	-1,765	Inventory gain is associated with cleanout and decommissioning activities at the facility.
		HEU	04/15/81	-25,465	The inventory gain is the result of identifying significant quantities of holdup and transferring this measured plant holdup to the plant inventory account.
		HEU	06/15/81	-3	Inventory gain is associated with cleanout and decommissioning activities at the facility.

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
Babcock & Wilcox, Lynchburg Research Center, VA	SNM-778	LEU	04/30/81	-110	The inventory difference falls within the regulatory limit.
Babcock & Wilcox - CNFP, Lynchburg, VA	SNM-1168	LEU	01/14/81	181	The inventory difference falls within the regulatory limit.
Combustion Engineering, Hematite, MO	SNM-33	LEU	None	-	-
Combustion Engineering, Windsor, CT	SNM-1067	LEU	06/24/81	836	The inventory difference falls within the regulatory limit.
Exxon, Richland, VA	SNM-1227	LEU	03/27/81	20,887	The inventory difference is the result of using Uf_6 input factors instead of process data, overstatement of shipments, and scrap material that were either overstated or understated on beginning inventory or ending inventory.
General Atomic, La Jolla, CA	SNM-696	LEU	03/16/81	171	The inventory difference falls within the regulatory limits.
		HEU	01/19/81	1,145	The inventory difference falls within the limit set by the Commission.
		HEU	03/16/81	-2,477	The inventory difference is due to corrections for prior periods and understatement of the previous inventory.

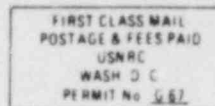
Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
		HEU	05/18/81	1,627	Investigation of the inventory difference found that the previous ending inventory had been overstated by 140 grams. No other discrepancies were found.
General Electric, Wilmington, NC	SNM-1097	LEU	None	-	-
Nuclear Fuel Services, Erwin, TN	SNM-124	HEU	01/21/81	5,097	The inventory difference falls within the limit set by the Commission.
		HEU	03/25/81	-1,905	The inventory difference falls within the limit set by the Commission.
		HEU	05/27/81	5,531	The inventory difference falls within the limit set by the Commission.
		LEU	05/13/81	-5,312	The inventory difference falls within the regulatory limit.
Texas Instruments, Attleboro, MA	SNM-23	HEU	02/25/81	7	The inventory difference falls within the regulatory limit.
		HEU	04/29/81	19	The inventory difference falls within the regulatory limit.
		HEU	06/24/81	3	The inventory difference falls within the regulatory limit.

Licensee	License No.	Material Type	Inventory Date	Inventory Difference (Grams U-235)	Explanation
Union Carbide, Tuxedo, NY	SNM-639	HEU	02/27/81	29	The inventory difference falls within the regulatory limit.
		HEU	04/29/81	-39	The inventory difference falls within the regulatory limit.
United Nuclear Corp., Montville, CT	SNM-368	HEU	01/16/81	220	The inventory difference falls within the regulatory limit.
		HEU	03/20/81	-683	Following factors contributed to inventory difference: items found on inventory but not on inventory listing and improved analysis technique for assay of one waste stream.
		HEU	05/15/81	-464	Most of the gain was due to failure to list all items on the beginning inventory.
Westinghouse, Columbia, SC	SNM-1107	LEU	05/31/81	-26,989	The inventory difference falls within the regulatory limit.

NRC FORM 335 (7-77)		U.S. NUCLEAR REGULATORY COMMISSION BIBLIOGRAPHIC DATA SHEET		1. REPORT NUMBER (Assigned by DDC) NUREG-0430 Vol. 2, No. 1	
4. TITLE AND SUBTITLE (Add Volume No., if appropriate) Licensed Fuel Facility Status Report Inventory Difference Data January 1981 - June 1981				2. (Leave blank)	
7. AUTHOR(S)				3. RECIPIENT'S ACCESSION NO.	
9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) U.S. Nuclear Regulatory Commission Office of Inspection and Enforcement Washington, D.C. 20555				5. DATE REPORT COMPLETED MONTH April YEAR 1982	
12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Same as 9				DATE REPORT ISSUED MONTH July YEAR 1982	
13. TYPE OF REPORT Status Summary Report				6. (Leave blank)	
15. SUPPLEMENTARY NOTES				8. (Leave blank)	
16. ABSTRACT (200 words or less) <p>NRC is committed to the periodic release of inventory difference data from the licensed fuel facilities after the agency has had an opportunity to review the data and has performed any related investigations associated with the data. This report, NUREG-0430, Vol. 2, is a continuation of NUREG-0430, Vol. 1, for reporting inventory difference data for active, licensed fuel facilities.</p>				10. PROJECT/TASK/WORK UNIT NO.	
17. KEY WORDS AND DOCUMENT ANALYSIS				11. CONTRACT NO.	
17a. DESCRIPTORS				13. TYPE OF REPORT Status Summary Report	
17b. IDENTIFIERS/OPEN-ENDED TERMS				PERIOD COVERED (Inclusive dates) January 1, 1981 - June 30, 1981	
18. AVAILABILITY STATEMENT Unlimited				14. (Leave blank)	
19. SECURITY CLASS (This report) Unclassified				21. NO. OF PAGES	
20. SECURITY CLASS (This page) Unclassified				22. PRICE \$	

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

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NUREG-0430, Vol. 2, No. 1

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JULY 1982