

# memorandum

DATE: JAN 30 1998

REPLY TO:

ATTN OF: Jenny Craig, EM-24

SUBJECT: Plutonium in Waste Inventories

TO: Distribution

The purpose of this memorandum is twofold: (1) to inform you of information to be released at the Secretary's Press Conference as part of the Department's Openness Initiative scheduled for February 6; and (2) to request your assistance in analyzing the causes and recommending corrections for differences between systems that track plutonium inventories. The Department will be releasing a report entitled "Plutonium: The First Fifty Years," which includes an appendix on how much plutonium the Department has in waste. The information for this appendix was taken from the Nuclear Materials Management and Safeguards System (NMMSS) database, and presents a 0.5 metric ton inconsistency between what is considered waste and what is considered "normal operating losses" (NOL). In addition, the waste numbers in NMMSS do not always correspond to waste information in the Office of Environmental Management's Integrated Database and other site-specific sources.

We have been working with your staff on these waste data differences, but realistically these inconsistencies cannot be completely resolved before the Openness Initiative press conference. Therefore, the Secretary has established a working group to study the different accounting methods for plutonium data, to resolve differences from these methods, and to make recommendations on the appropriateness of making changes to how the Department tracks its plutonium inventories.

You should be aware that the news media and public may contact your site with questions about these inconsistencies. The primary difference between waste and NOL as reported in NMMSS is found at Hanford; inconsistencies between waste as reported in NMMSS and waste as tracked by the Environmental Management program are found primarily at five sites: Savannah River Site; Los Alamos National Laboratory; Oak Ridge National Laboratory; Idaho National Engineering Laboratory; and Rocky Flats Environmental Technology Site.

For your information, we have attached:

- (1) Table of plutonium waste data from NMMSS that will be released to the public on February 6 (attachment A);

- (2) A side-by-side table of the report's data and the Environmental Management data for you to better understand the inconsistencies between NMMSS data and IDB and other site data (attachment B);
- (3) A more detailed breakdown of the Environmental Management estimates (attachment C).

We request that you continue to resolve the differences in accounting for how much plutonium in waste is reported at your site. Attachment D presents a list of contacts at the five sites. As the working group is more formally established, you will receive a request for an initial report on the different plutonium waste numbers.

The Department's preliminary explanation for (1) the inconsistency within NMMSS of plutonium waste and NOL; and (2) the inconsistency between waste data in NMMSS and other sources, such as the IDB, is summarized below:

1. Plutonium in "Waste" Estimates Compared with "Normal Operating Losses".

Plutonium that is technically or economically unrecoverable and intentionally sent to waste is referred to as "normal operating losses" (NOL) and is removed from the DOE/DoD plutonium inventory. The plutonium in waste is not subject to the same degree of rigorous safeguards and security as the DOE/DoD plutonium inventory.

- The quantities of plutonium removed from the DOE/DoD inventory and placed in waste as NOL are determined by either direct measurement or estimated based on measured sampling methods and practices -- for example, all liquid wastes are sampled and analyzed prior to being sent to a waste tank. The NMMSS indicates that a total of 3.4 metric tons (MT) of plutonium were sent to waste by way of NOL.
- The method used to estimate plutonium in waste burial sites and tanks was based on extrapolation from direct measurements of the waste -- for example, a small sample of radioactive waste is taken from a waste tank, the amount of plutonium in that sample is analyzed, and the amount of plutonium is estimated by multiplying this small sample times its relative proportion in the larger waste volume. The total amount of plutonium in NMMSS waste accounts is 3.9 MT.

Because the NMMSS was originally designed for safeguards purposes for nuclear materials, there was no need to reconcile the NOL quantities with the later quantities recorded in the NMMSS waste accounts. The 0.5 MT difference in NMMSS between the NOL estimate (3.4 MT) and the "waste" estimate (3.9 MT) is attributable to two primary causes:

- (a) Waste inventories are tracked for environmental, safety and health reasons, and are therefore not necessarily calculated like normal operating losses. Waste inventory calculations and normal operating losses both rely on independent measured estimates,

which lead to some degree of uncertainty in each. The normal operating losses are used for safeguards and security purposes and may not include all the information that may be required for waste inventories.

In the early 1970s, sites began reporting details of plutonium in waste for the first time in NMMSS. At most sites the estimates of the amount of plutonium estimated to be in "waste" were based on direct measurement of waste and provided confirmation of the NOL estimates of waste. In the case of Hanford, however, the 1974 estimate indicated 0.4 MT more plutonium in waste than in normal operating losses. This difference could be either: (i) an accounting error at the site, such as reporting plutonium already included in the normal operating losses; or (ii) additional plutonium not captured by the normal operating losses tracking system, and therefore likely reported as "inventory differences." While site records do not allow the Department to determine the source of this inconsistency at this time, the Department has performed additional analysis supporting the higher estimate of plutonium in waste and, using this higher estimate, has determined that there are no imminent health, safety, or environmental risks. Since 1974, the normal operating losses and waste inventories have tracked very closely.

(b) Waste includes off-site sources, including plutonium waste from the Navy and from licensed commercial facilities. Most commercial waste came from two facilities that fabricated fuel for reactors: the Nuclear Fuel Services at Erwin, Tennessee, and Cimarron Corporation at Crescent, Oklahoma. Normal operating losses include only waste generated from on-site production. Since 1974, the remaining 0.1 MT inconsistency tracks closely to wastes received from sources outside of the Department.

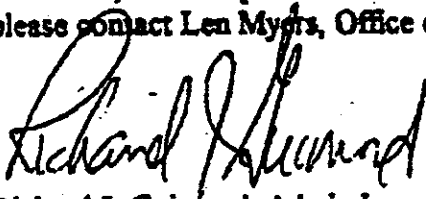
(2) "Waste" Estimates in the NMMSS System Compared to Other "Waste" Inventories.

In addition to the difference between waste and normal operating losses within NMMSS, the amount of plutonium waste in this report may not reflect the amount of waste reported in other Departmental sources, such as the Integrated Database (IDB) or site-specific waste tracking systems. Two primary reasons for these apparent inconsistencies include: (1) the NMMSS waste data reflect only fissile plutonium inventories (i.e., Pu-239), while other sources include all isotopes of plutonium; and (2) the IDB does not differentiate between waste that requires nuclear material safeguards, and therefore is still recorded as part of the inventory, and waste that is physically sent to a waste burial site. Because of different intended uses of these databases, differing quantities of plutonium in waste can arise.


As stated earlier, the Department's working group will examine these issues and make recommendations on the appropriateness of integrating the various inventory systems or developing a new tracking system for all forms of plutonium.

If you have any questions, please contact Jenny Craig at (202) 586-8106 in the Office of Planning, Policy and Budget (EM-24). For specific information on the Environmental Management estimates of plutonium waste inventories, please contact Matt Zenkovich,

Office of Waste Management (EM-35) at (301) 903-7176; for information on estimates of other plutonium inventories managed by EM-funded activities and facilities, please contact Rick Martinez, Office of Nuclear Materials and Facilities Stabilization (EM-65) at (301) 903-4484; and for questions on the data in the report "Plutonium: The First Fifty Years," please contact Len Myers, Office of Defense Programs, at (301) 903-5366.



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Attachments

**ATTACHMENT A : "50 YEARS OF PLUTONIUM" APPENDIX**

**Table 16. DOE Plutonium In Waste Inventory**

Location	kg Pu	Description
Savannah River Site Burial Ground	193	Solid waste stored in containers. Waste consists of many forms when packaged - nitrates, fluorides, oxides, and oxalates. Over time, the oxidizing conditions force the chemistry of the metals to their most stable form. At this time, the primary form of material in the containers is an oxide or a complex form involving oxygen.
	382	Liquid waste in high level waste tanks. This material will eventually be converted to a glass form for long term storage.
Los Alamos National Laboratory Burial Ground	610	Solid waste in various forms.
Nevada Test Site Burial Ground	16	Solid waste received from Rocky Flats Plant and Pantex Plant is stored in retrievable land burial or in above ground containers.
Argonne National Laboratory-West	2	Plutonium embedded in irradiated reactor test loops and reactor blanket assemblies stored in dry storage tubes underground.
Hanford Site	455	High level waste in the tank farms.
	875	Solid waste in the burial grounds.
	192	Low level waste in cribs, trenches and ponds.
Oak Ridge National Laboratory	41	Particulate waste, as sediment in a settling basin, dry solids and oxides in above and below surface burial grounds, and solution and sludge in storage tanks.
Idaho, Waste Management	1,026	Solid waste in drums and boxes received primarily from Rocky Flats Plant is stored in above ground pads covered with earthen berms.
Idaho, Idaho Chemical Processing Plant Waste Farm	8	Solutions stored in tank farms.
	72	Calcined waste stored in bins.
Rocky Flats - Awaiting Disposition	47	Solid waste packaged in drums and crates awaiting shipment to a burial site.
<b>Total</b>	<b>3,919</b>	

## ATTACHMENT B

### INCONSISTENCIES IN THE AMOUNT OF PLUTONIUM IN WASTE (KG OF PU SHOULD BE REPORTED AS OF SEPTEMBER 1994)

SITE	"50 Years" Report	IDB/other EM sources	Why difference in accounting?
Savannah River Site (1) Solid waste in containers	193.00	184.50	Report table may include #3 in this category, which would make difference of 1.7 kg.
(2) Liquid HLW in tanks	382.00	774.60	SRS waste management agrees with higher number.
(3) Buried TRU		6.80	Might be included under #1.
Los Alamos NL Solid waste in various forms	610.00	1,375.30	EM number includes 1,323.7 in stored TRU and 51.6 in buried waste. AL waste management agrees with higher number. Is full difference due to what is still managed under safeguards and security?
Nevada Test Site Solid waste	16.00	13.00	
Argonne NL - West Pu embedded in irradiated reactor test loops and reactor blanket assemblies stored in dry storage tubes underground.	2.00		Maybe this amount was reported for Idaho?
Argonne NL - East Pu in stored TRU		0.57	Not mentioned in report table.
Hanford Site (1) HLW in tanks	455.00	455.00	No difference
(2) Solid waste in burial grounds and in storage	875.00	875.00	No difference.
(3) Waste in cribs, trenches, ponds	192.00	192.00	No difference.
Oak Ridge NL (1) Particulate waste, as sediment in a settling basin, dry solids and oxides in above and below surface burial grounds, sod solution and sludge in storage tanks.	41.00		Same category as #2?
(2) Pu stored in TRU		21.82	Same category as #1?
Idaho NEL (1) Solid waste	1,026.00	1,051.00	Does EM number include 2 kgs. reported under Argonne West?

SITE	"99 Years" Report	IDB/other EM sources	Why difference in accounting?
(Z) High-level waste (in tanks and calcined)	80.00	80.00	No difference.
Rocky Flats Solid waste ("awaiting shipment to a burial site")	47.00	191.91	RF waste management agrees with higher number. Is full difference due to Pu still managed under safeguards and security?
WVDP High-level waste		0.50	Not mentioned in report table
Lawrence Livermore Pu in stored TRU		2.63	Not mentioned in report table
<b>TOTAL WASTE</b>	<b>3,919.00</b>	<b>5,224.63</b>	

Note: Sites with less than .5 kg not included: Lawrence Berkeley NL, Paducah, Pantex, ETEC, and Mound.

**ATTACHMENT C**

**ENVIRONMENTAL MANAGEMENT ESTIMATES OF PLUTONIUM (Pu) IN WASTE  
AS OF SEPTEMBER 1994 (a)**

Site	Pu in High Level Waste (kg)	Pu in Stored Transuranic Waste (kg) (b)	Pu in Buried Waste (kg) (c)	Pu in Soils (e.g., cribs) (kg)	Total Pu in Waste (kg)
Argonne -East		0.57			0.57
Argonne -West					
Hanford	455.00	515.00 (d)	360.00 (d)	192.00 (d)	1,522.00
Idaho Nat'l Eng. Lab.	80.00 (f)	694.00	357.00 (e)		1,131.00
Lawrence Livermore NL		2.81			2.81
Los Alamos NL		1,323.70	51.60	0.12	1,375.42
Nevada Test Site		7.26	5.73		12.99
Oak Ridge NL		21.82			21.82
Rocky Flats		191.91			191.91
Savannah River Site	774.60	184.50(g)	6.80 (g)		965.90
West Valley	0.50	<0.01			0.51
<b>TOTAL</b>	<b>1,310.10</b>	<b>2,941.58</b>	<b>781.13</b>	<b>192.12</b>	<b>5,224.93</b>

(a) All information from Integrated Database (IDB) Report Revision 11 (Sept. '95) except as noted. This table does not include sites with less than 0.5 kg of Pu in waste: ETEC, Lawrence Berkeley NL, Mound, Paducah, and Pantex. It also does not include "materials in inventory" that have not been declared waste but that are not longer needed for their original purposes.

(b) Post-1970 transuranic (TRU) waste in storage, both contact-handled and remote-handled.

(c) Pre-1970 buried TRU waste.

(d) Richland Operations Office, Solid Waste Information Tracking System.

(e) IDB Report Revision 8 (Oct. 1992).

(f) Idaho National Engineering Laboratory (INEL).

(g) Savannah River Site communication (1/96).