DOE FACTS

DECLASSIFICATION OF THE UNITED STATES PLUTONIUM INVENTORY AND RELEASE OF REPORT, "PLUTONIUM: THE FIRST 50 YEARS"

The Department of Energy has declassified the United States plutonium inventory and other information needed to present a complete picture of the production, acquisition, and use of plutonium from 1945 through September 30, 1994. The Secretary of Energy's commitment of June 27, 1994, to inform the public about the details of the United States plutonium story is met by release today of a comprehensive report, "Plutonium: The First 50 Years."

SPECIFICALLY:

- The total United States Government plutonium inventory is 99.5 metric tons, which includes plutonium at the Department of Energy sites and plutonium in the nuclear weapons stockpile under custody of the Department of Defense. The locations of the inventory are shown in an attached map. For unclassified reporting, all plutonium in the Department of Defense custody is added to the Pantex Site total.

- The total plutonium removed from the United States inventory is 12.0 metric tons:

  - Expended in nuclear tests — 3.4 metric tons
  - Inventory differences — 2.8 metric tons
  - Waste (normal operating losses) — 3.4 metric tons

(More)

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- Fission and transmutation 1.2 metric tons
- Decay 0.4 metric tons
- Domestic transfers 0.1 metric tons
- Foreign transfers 0.7 metric tons

- A majority of the United States plutonium (85 percent) is weapon-grade, which is predominately Pu^{239} with less than 7 percent Pu^{240} by weight and a small amount of heavier plutonium isotopes.

- Production and acquisition of plutonium amounted to:

- Savannah River Site and Hanford Site production reactors	103.4 metric tons
- Research reactors	0.6 metric tons
- Domestic sources	1.7 metric tons
- Foreign countries	5.7 metric tons
Total	111.4 metric tons

The total production and acquisition of plutonium is equal to the current total inventory plus the total removals.

- An attached map shows the locations and quantities of the plutonium in waste. Most of the plutonium was removed from the inventories as normal operating losses. However, not all plutonium in waste is necessarily derived from normal operating losses.

BACKGROUND:

- In a previous announcement on December 7, 1993, the Department of Energy revealed its inventories of plutonium, excluding the Pantex Site. Today's announcement includes all of the Department of Energy's sites as well as plutonium in the nuclear weapons stockpile under the custody of the Department of Defense.

- Plutonium was produced from 1945 through 1994 to support the United States nuclear weapons, nuclear energy, and reactor development programs.

- The quantities listed are based on the available records, some of which are very old. The quantities may be updated after reevaluation of the original records.

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- Similar information is planned for future release on highly enriched uranium in approximately 1 year.

BENEFITS:

- As part of its Openness Initiative, the Department of Energy is declassifying information regarding the Government's plutonium inventory and all remaining information on its production, acquisition, and use of plutonium. As a result of this declassification, the American public will have information that is important in consideration of the proper management and ultimate disposition of the plutonium stockpile.

- Openness encourages informed public debate on plutonium management including safety, security, and storage.

- The release of this information should encourage other nations to declassify similar information.

- The data will be of some aid to regulators who oversee environmental health and safety activities.

- The data will permit more environmental related information to be provided to stakeholders and to the public.

- The data will provide valuable nonproliferation benefits by making potential International Atomic Energy Agency safeguards arrangements easier to implement.

- Declassification of the information promotes Government accountability and trust in Government by the public.

- By declassification, the United States Government is acting as a global leader in nuclear information transparency.

WHO ARE THE KEY STAKEHOLDERS?:

- The Public. Data will be available for public discussion of United States plutonium acquisition, production, and use.

- Public Interest Organizations. Stakeholders include environmental, safety, and health groups; historians, archivists, and researchers; scientists; industrial workers; and local, State, and Federal personnel. All groups interested in oversight of plutonium-related activities will now have additional information about plutonium production, acquisition, and use.

- Freedom of Information Act Users. Citizens submitting Freedom of Information Act requests will have greater access to the data they seek.

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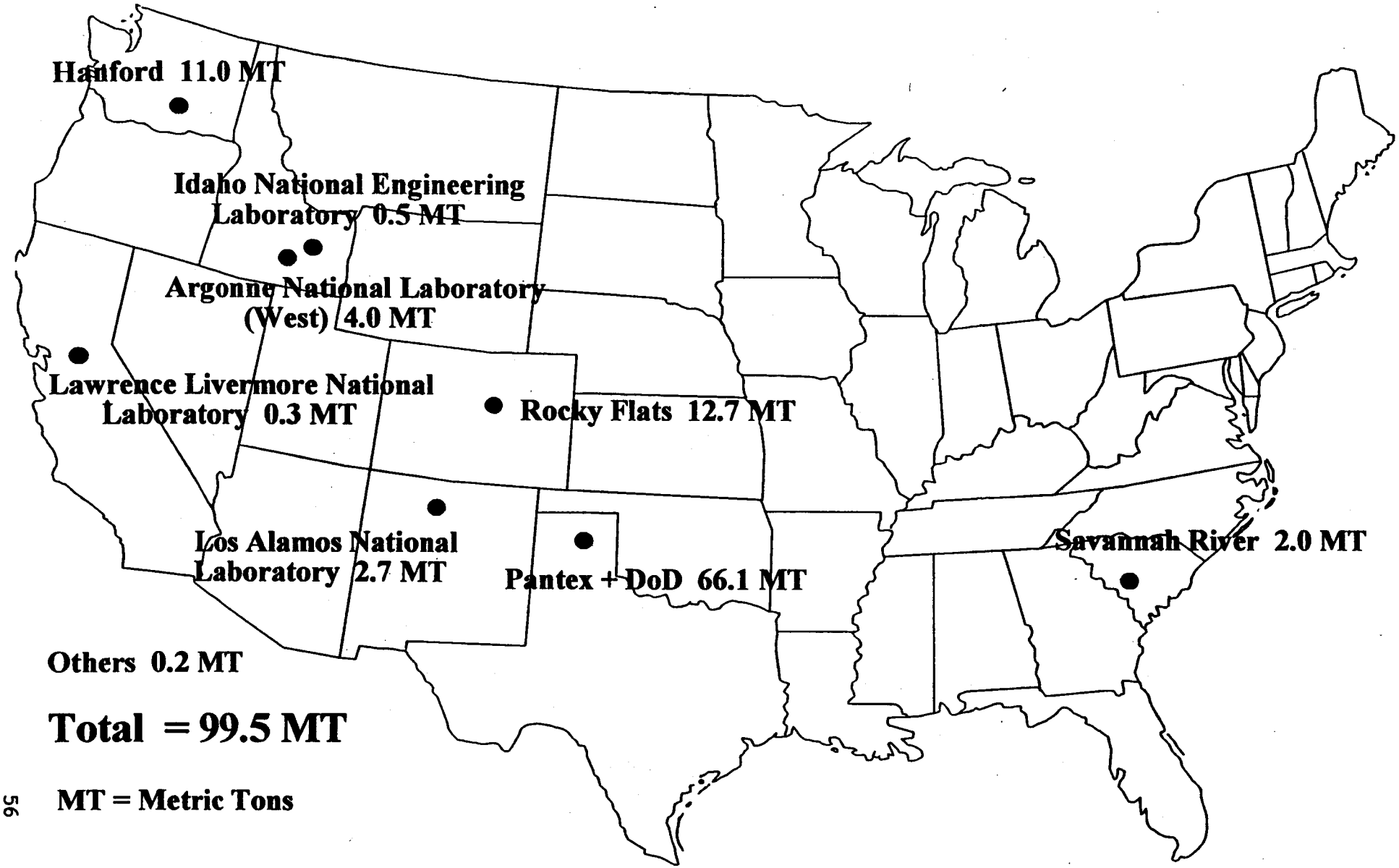
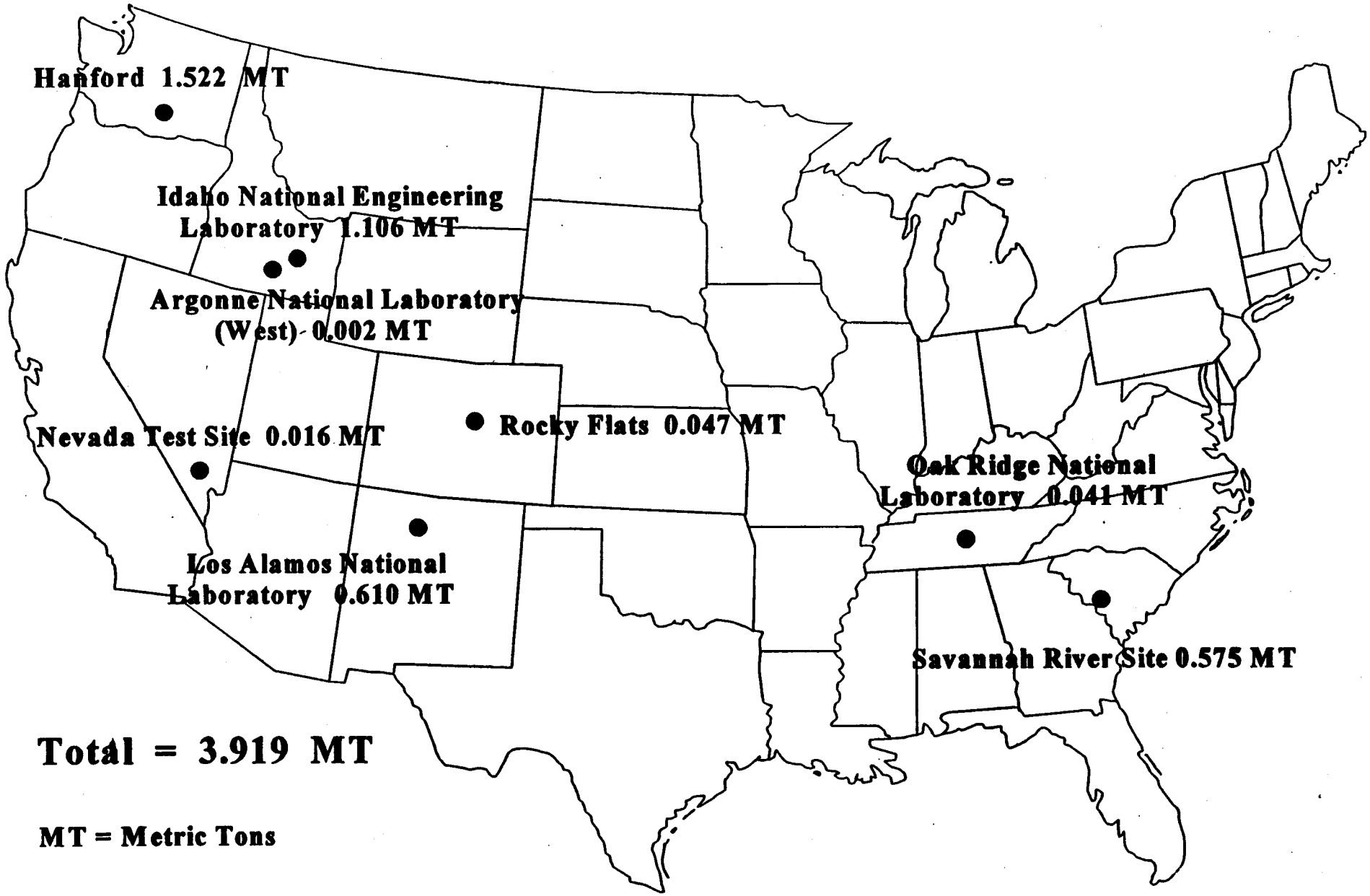
Plutonium Inventories



Plutonium Waste Sites



Total = 3.919 MT

MT = Metric Tons

DOE FACTS

QUESTIONS AND ANSWERS

Q. What is the United States plutonium inventory by grade of material?

A. Weapon-grade plutonium accounts for approximately 85.0 metric tons; fuel-grade accounts for approximately 13.2 metric tons; and reactor-grade accounts for approximately 1.3 metric tons.

Q. Why have the plutonium inventories at the Pantex Site and the Department of Defense been reported as a total value rather than separate amounts?

A. In contrast to other Department of Energy sites, plutonium at the Pantex Site and the Department of Defense is contained in nuclear weapon assemblies. The amount of plutonium associated with nuclear weapons continues to be sensitive information which is protected through classification.

Q. What are normal operating losses?

A. Normal operating losses or waste occurs when quantities of plutonium, determined by measurement or estimated on the basis of measurement, are intentionally removed from inventory because they are technically or economically unrecoverable and are disposed of by approved methods. Examples of plutonium bearing items sent to burial sites include discarded piping, contaminated laundry, and shoe covers. Sites with plutonium waste are shown in the preceding map.

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Q. Is any part of the 2.8 metric tons of plutonium listed under "inventory differences" missing?

A. None of the plutonium in the category "inventory differences" is missing. Inventory differences result from reconciling "book inventories" and "physical inventories," after adjustments for transactions, removals, decay, corrections, transmutation, and production. The size of the inventory differences results from remeasurements, high measurement uncertainty of material held up in processing facilities, data rounding, and input errors. Before the mid-1970s, we did not have the highly precise, accurate measurement capabilities and the rigorous accounting practices that exist today. That situation significantly contributed to the differences observed during the earlier period. An example of inventory differences is provided in the attached illustration. The inventory differences by location are shown in the attached map.

Q. Explain the category of plutonium removal listed as "fission and transmutation."

A. Fission and transmutation removals consist of plutonium consumed by nuclear irradiation in a reactor. Fission and transmutation can be divided into two categories: burnup and isotope production. The burnup category accounts for plutonium that was consumed in the operation of experimental fast neutron and breeder reactors. The objective of the Department of Energy's isotope development program was to develop and produce radioisotopes and demonstrate their applications for industry, medicine, and nuclear and radiation research. For example, in the late 1960s Californium-252 was produced in the Savannah River Site reactors and in the Oak Ridge National Laboratory high flux isotope reactor. Californium-252 is an excellent spontaneous fission neutron source for well logging, industrial radiography, nuclear physics research, and medical applications.

Q. How long has the plutonium waste at Rocky Flats been awaiting shipment to a burial site?

A. Rocky Flats has been storing plutonium waste since September 1989, when shipments to the Idaho National Engineering Laboratory were stopped. Some waste generated by Rocky Flats before September 1989 was also awaiting shipment.

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Q. The largest plutonium waste quantity is at the Hanford Site. Why is it so large, and what is the composition?

A. The waste inventory at the Hanford Site is large since it was the largest and oldest plutonium production site. The total plutonium waste inventory is approximately 1,522 kilograms and consists of 455 kilograms in tanks, 192 kilograms in ditches and cribs, and 875 kilograms in solid wastes.

Q. Is the stored plutonium waste a hazard to workers or the public?

A. The plutonium waste is packaged and stored in facilities equipped with appropriate safety systems and monitored regularly in accordance with regulations. It therefore presents only limited risk of radiological exposure to the onsite workers and virtually no risk to the public. Much progress has been made in reducing the risk associated with high level waste stored in tanks. Hazards associated with plutonium and other radionuclides stored in tanks remain at the top of the Department of Energy's environmental management priorities.

Q. What are the Department of Energy's plans for disposition of the Rocky Flats plutonium waste stored at the Idaho National Engineering Laboratory? Did not the Department agree to exhume and remove it?

A. Currently, the waste remains at the Department of Energy Idaho National Engineering Laboratory Radioactive Waste Management Area. The Transuranic Storage Area Retrieval Enclosure Project should allow for its safe retrieval starting in Fiscal Year 1997. When retrieved, the waste will be stored in compliance with the Resource Conservation and Recovery Act until it can be appropriately disposed. The Department currently plans to ship this waste for disposal at the Waste Isolation Pilot Project, either directly or after treatment. The Department of Energy Idaho Operations Office is expected to award a contract for private sector treatment of waste by June 1996. Treatment of waste could start as soon as Fiscal Year 2003. After treatment, the Department plans to ship the waste from Idaho for disposal at the Waste Isolation Pilot Project.

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Q. Why is there a 0.5 metric ton inconsistency in the amount of plutonium the Department of Energy estimates it has in "waste" and the quantity of plutonium removed as "normal operating losses?" Is there 0.5 metric tons of plutonium missing?

A. No. There is not 0.5 metric ton of plutonium missing. The difference in the amount of plutonium in "normal operating losses" and "waste" is twofold: First, the normal operating losses and waste are independent measured estimates and are tracked for different purposes. At most sites, the estimates of the amount of plutonium in waste, based on direct measurement of waste, provided a double check that confirmed normal operating losses estimates. In the case of Hanford, however, the 1974 estimate indicated 0.4 metric ton more plutonium in waste than in normal operating losses. While historical 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, normal operating losses and waste inventories have tracked very closely.

Second, waste inventories include offsite sources, including plutonium waste from the Navy and from licensed commercial facilities. Normal operating losses include only waste generated from onsite production. Since 1974, the remaining 0.1 metric ton inconsistency between normal operating losses and waste tracks closely to wastes received from sources outside the Department.

The Department believes that the difference in the amount of plutonium reported as waste and normal operating losses reflect two different methods for recording information. To reconcile these methods and to determine whether other changes are appropriate to further increase the rigor of its plutonium accountability, the Department has formed a working group to analyze the systems and make recommendations for change if appropriate. For more information on this issue, see appendix B of "Plutonium: The First 50 Years."

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Q. Is there any reason to believe that plutonium material or waste diversion has taken place at Hanford?

A. No. There is no reason to suspect plutonium material or waste diversion. The estimates in the waste inventory system are larger than those estimated by normal operating losses. Consequently, one would conclude that the issue is one of accounting for more material in inventory, not less. Moreover, the plutonium in question is in a waste form and, therefore, a small part of a matrix of materials. This matrix contains highly radioactive decay isotopes such as americium. The large volume and radioactive "self-protecting" nature of the waste would have made diversion extremely difficult. In addition, the safeguards in place at Hanford with required audits and material balances would significantly reduce the likelihood of this problem.

Q. The Department estimates 455 kilograms of plutonium in the waste tanks at the Hanford Site spread among 177 tanks. Is there a danger in the waste tanks that could raise the question of criticality?

A. Yes; in any system that contains more than a critical mass of plutonium, there will always be the potential for criticality. However, in 1992, the Department and Westinghouse Corporation conducted a full safety analysis for the Hanford tanks to evaluate the potential for criticality. This analysis determined that the waste in the tanks was very subcritical and would remain subcritical during storage, routine maintenance, and transfers of waste among tanks as long as adequate criticality control limits (e.g., mass and concentration of fissile materials) are in place. All tanks and the waste forms (i.e., liquid waste, salt cake, and sludge) in the tanks were evaluated and found to be subcritical based upon low fissile material concentration, the presence of neutron absorbers and, in most cases, significant quantities of water.

The Department and Westinghouse have formed a team of experts to study technical issues, such as nonhomogeneity of waste in the tanks, redistribution and localized concentration of fissile material, and segregation of absorber and fissile material. For other, nonroutine tank operations (e.g., retrieval of waste from a tank) additional safety analyses will be necessary to evaluate the potential for criticality.

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Q. Is there a public health threat or environmental risk with the 192 kilograms of plutonium in the soils at Hanford? Will it be "cleaned up" or removed? When?

A. This plutonium contaminated soil has not yet shown to be an immediate danger to workers, the public, or the environment. However, long-term risks are of concern and are being defined for future action. Many factors determine whether there is a significant health or environmental risk with plutonium in soil, such as the exposure to workers or the public and how much and how quickly the plutonium migrates in the soil or groundwater. The Department of Energy and the State of Washington's Department of Ecology, through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) process, are currently analyzing the potential risks posed by this plutonium-contaminated soil to determine what remedial actions are appropriate.

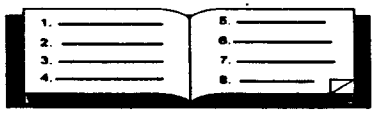
Q. Is the 192 kilograms of plutonium in the soils at Hanford more than the plutonium in waste intended to go to the Waste Isolation Pilot Plant? Is it more than other forms of plutonium intended for disposal or remediation, such as buried waste, tank waste, and spent nuclear fuel?

A. No. The 192 kilograms of plutonium estimated to be dispersed in the soils and groundwater at Hanford is less than one-half of the 515 kilograms of plutonium at Hanford's transuranic waste intended for the Waste Isolation Pilot Plant. It is also less than the 360 kilograms of plutonium in transuranic waste buried before 1970 and the estimated 455 kilograms of plutonium in the tank waste.

In addition, the 192 kilograms of plutonium in soils and groundwater are significantly less than other forms of plutonium at Hanford. There are approximately four metric tons of plutonium in the spent nuclear fuel in the K Basins, four metric tons of plutonium in the Plutonium Finishing Plant inventory, and four metric tons of plutonium in the Fast Flux Test Facility fuel. These materials are being managed by the strategies outlined in the Spent Fuel Programmatic Environmental Impact Statement.

Inventory Difference Is Book Inventory Less Physical Inventory

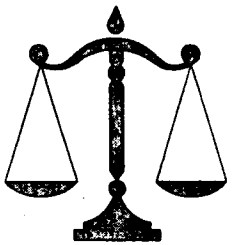
Book Inventory



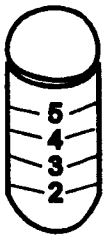
= 100 Total Kilograms

Physical Inventory = Line by Line From Book Inventory

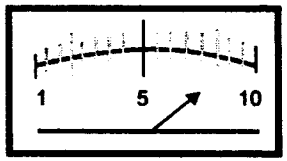
By Eye



By Measurement



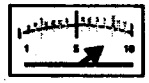
By Instrument



Line 1

= 21 Kilograms

Line 2



= .5 Kilograms

Line 3

= 3 Kilograms

etc.

= 65.5 Kilograms

90 Kgs Total

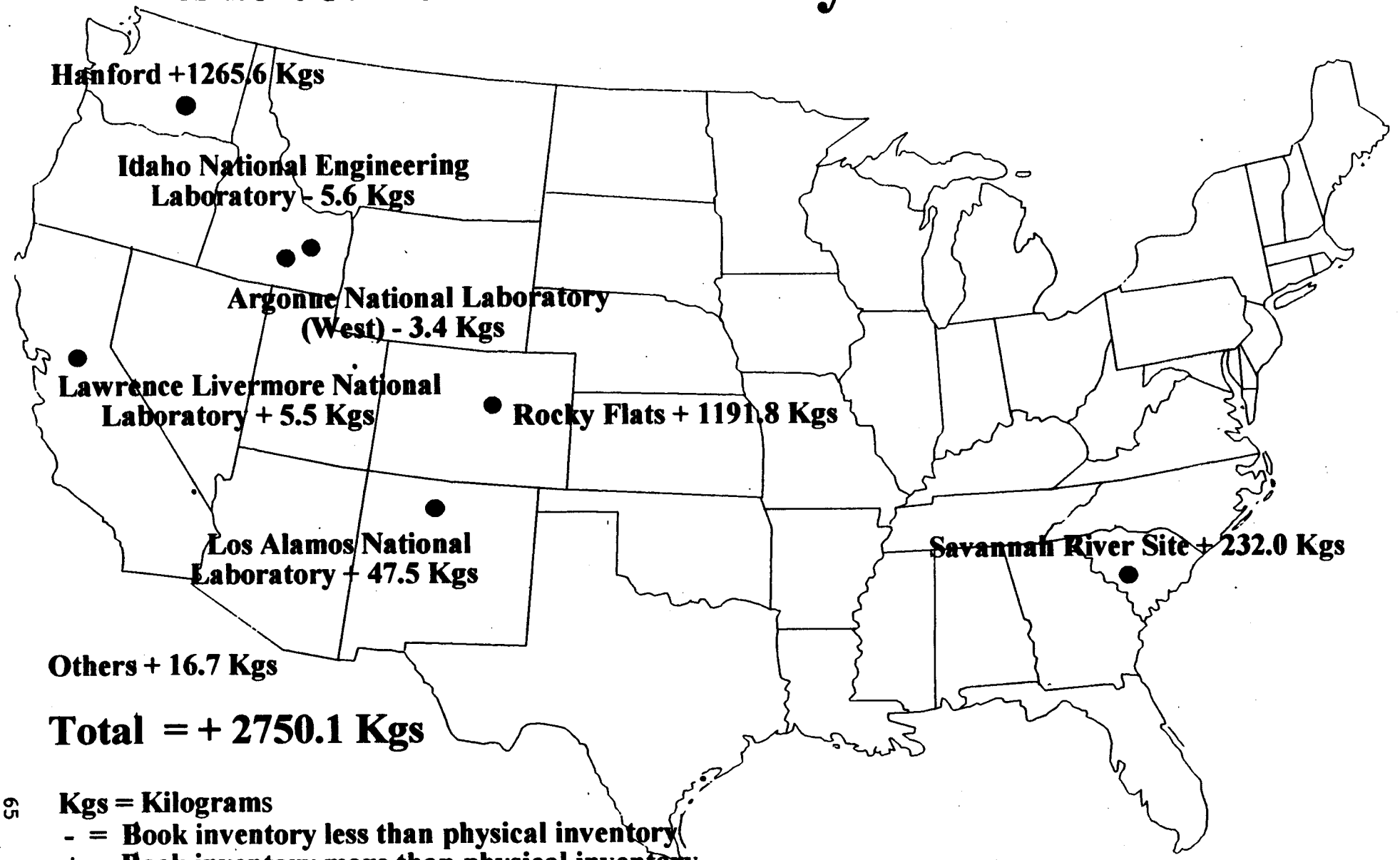
Example

Book Total 100 Kgs
- Physical Total 90 Kgs

= + 10 Kgs ID

+ figure = Decrease in Book Inventory

Plutonium Inventory Differences



Others + 16.7 Kgs

Total = + 2750.1 Kgs

Kgs = Kilograms
- = Book inventory less than physical inventory
+ = Book inventory more than physical inventory