SECTION 3
U.S. HEU INVENTORY

As of September 30, 1996, the total U.S. HEU inventory was **740.7** MTU containing **620.3** MTU-235. In this report, HEU in waste is not reported as part of the U.S. inventory and is not included in the overall quantity. Most of the HEU in waste has been removed from the U.S. inventory as "normal operating losses" because it is technically too difficult or uneconomical to recover. Normal operating losses are also referred to as measured discards.

U.S. HEU Inventory (as of September 30, 1996)

Location	*MTU*
Y-12 Plant, Pantex Plant and Department of Defense	651.6
Idaho National Engineering & Environmental Laboratory	27.4
Savannah River Site	22.2
Portsmouth Gaseous Diffusion Plant	21.7
Rocky Flats Environmental Technology Site	6.0
Los Alamos National Laboratory	3.5
Other	8.3
Total	740.7

LOCATION OF THE U.S. HEU INVENTORY

Table 3-1 presents data on the location and total quantity of HEU in the U.S. inventory as of September 30, 1996. The information is provided in two assay ranges: (1) HEU with a concentration of 20 percent or more of uranium-235, but below 90 percent by weight, and (2) HEU with a concentration of 90 percent or more of uranium-235 by weight.

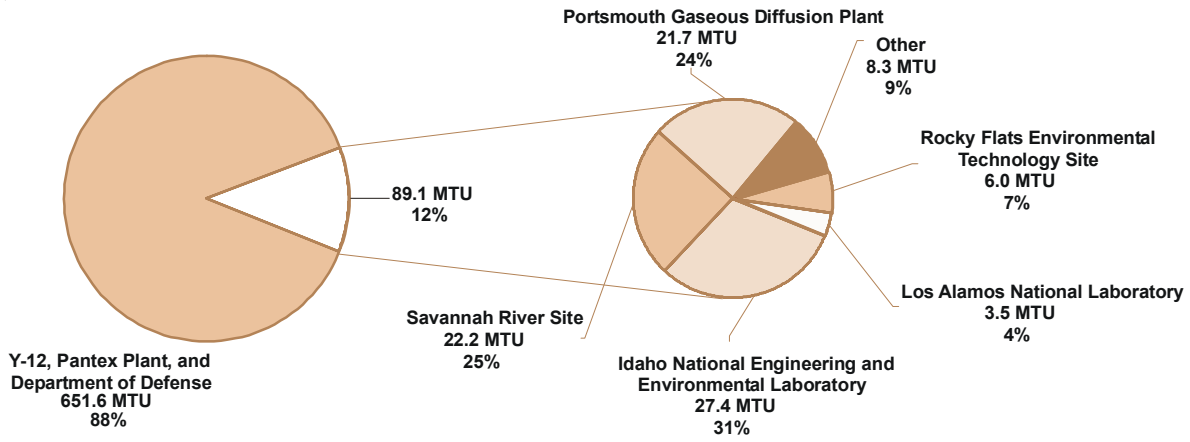
Y-12 PLANT, PANTEX PLANT AND DOD

Approximately 88 percent of the U.S. HEU inventory is located at the Y-12 Plant in Oak Ridge, Tennessee, the Pantex Plant near Amarillo, Texas, and in the custody of the DoD. This material (**651.6** MTU) is in the form of weapons, dismantled weapons parts, Naval Nuclear Propulsion Program reactors, solutions from chemical recovery operations, canned oxides, combustibles stored in drums, and canned residues.

The current mission at the Y-12 Plant consists of weapon component dismantlement; special nuclear material storage; maintenance of technical capability for weapons development and production, stockpile maintenance and evaluation, and nonproliferation and arms control; and technology transfer.

The Pantex Plant has a mission to assemble nuclear weapons for the Nation's nuclear weapons stockpile; evaluate, repair, and retrofit nuclear weapons in the stockpile; and disassemble weapons being retired from the stockpile.

Table 3-1 U.S. HEU Inventory as of September 30, 1996



Location	20 to <90% U-235		≥90% U-235		Total	
	MTU	MTU-235	MTU	MTU-235	MTU	MTU-235
Y-12 Plant, Pantex Plant & Department of Defense [a]					651.6	557.4
Idaho National Engineering and Environmental Lab.[b]	23.1	15.3	4.3	4.0	27.4	19.3
Savannah River Site	21.6	14.1	0.5	0.5	22.2	14.6
Portsmouth Gaseous Diffusion Plant	13.9	6.6	7.8	7.5	21.7	14.1
Rocky Flats Environmental Technology Site			6.0	5.6	6.0	5.6
Los Alamos National Laboratory	0.4	0.2	3.2	3.0	3.5	3.2
Other						
Oak Ridge National Laboratory	1.6	1.3			1.6	1.3
K-25 Site	1.4	0.7	0.1	0.1	1.5	0.8
Sandia National Laboratory	0.2	0.1	0.5	0.5	0.7	0.6
Hanford Site	0.5	0.2			0.5	0.2
Brookhaven National Laboratory	0.3	0.2			0.3	0.2
Miscellaneous	1.8	1.2	1.9	1.8	3.7	3.0
Total					**740.7**	**620.3**

Note: Totals may not add due to rounding.

a For purposes of national security, the HEU inventory for the Y-12 Plant, the Pantex Plant, and the Department of Defense is a total combined quantity. As part of the Department of Defense inventory, the Naval Nuclear Propulsion Program includes 100 metric tons of HEU in nuclear-powered submarines, surface ships, and training platforms. In addition, this category includes the BWX Technologies Naval Nuclear Fuel Division facility, the Knolls Atomic Power Laboratory, the Bettis Atomic Power Laboratory, and the Expended Core Facility at the Idaho National Engineering and Environmental Laboratory. For purposes of national security, only the total quantities of uranium and uranium-235 are provided since the quantities in each assay range remain classified.

b The Idaho National Engineering and Environmental Laboratory includes the Idaho Chemical Processing Plant and the Argonne National Laboratory - West.

For purposes of national security, the HEU inventory for Y-12 Plant, the Pantex Plant and DoD is reported as a total quantity rather than separate amounts. In addition, information by the two assay ranges is not provided. This is necessary since the amount and enrichment of HEU associated with nuclear weapons continues to be sensitive information, which is protected through classification.

Composition of the HEU Inventory

- ✓ Pits and disassembled nuclear weapons parts
- ✓ Metals
- ✓ Oxides
- ✓ Process residues
- ✓ Compounds
- ✓ Solutions
- ✓ Reactor fuel
- ✓ Holdup materials
- ✓ Samples, sources, and standards
- ✓ Irradiated spent nuclear fuel

Naval Nuclear Propulsion Program

The HEU inventory for the Naval Nuclear Propulsion Program was 100 metric tons of uranium as of September 30, 1996, and was part of the Department of Defense inventory. The majority of HEU assigned to the Naval Nuclear Propulsion Program is already in or has been used in naval reactor cores. The remainder will be fabricated into fuel in the near future. As of September 30, 1996, the Navy had 96 operating submarines, 4 surface ships, 8 aircraft carriers, and 4 training platforms.

Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is located near Idaho Falls, Idaho. Its original mission was to test nuclear reactor prototypes, recover HEU from spent fuel, and then return the HEU to the stockpile. The mission at INEEL has changed to the interim storage of HEU, facility decontamination and decommissioning, and environmental restoration. INEEL has **27.4** MTU, mostly in the form of oxides, unirradiated and irradiated reactor fuel elements, residues, and sources.

Savannah River Site

The Savannah River Site (SRS), located near Aiken, South Carolina, operated continuously for 40 years as one of the primary producers and processors of nuclear materials. HEU was a major feedstock for the nuclear materials production process. SRS has about **22.2** MTU in the form of irradiated reactor fuel assemblies, cast HEU and aluminum alloy ingots, process residues, and solutions. Small quantities of HEU are present as sources, calibration standards, and laboratory samples.

Portsmouth Gaseous Diffusion Plant

The Portsmouth Gaseous Diffusion Plant, near Piketon, Ohio, has enriched uranium for government programs and commercial nuclear power plants at levels ranging from 4 percent to over 97 percent uranium-235. In 1991, production of HEU was terminated, and the plant mission changed to uranium enrichment for commercial reactors. The Energy Policy Act of 1992 transferred responsibility for Portsmouth from the DOE to newly created entity known as the United States Enrichment Corporation (USEC). The enrichment facilities are leased from DOE to USEC. Approximately **21.7** MTU of DOE-owned HEU in various physical and chemical forms, mainly solids, are stored at Portsmouth.

Rocky Flats Environmental Technology Site

The Rocky Flats Environmental Technology Site, near Golden, Colorado, has **6.0** MTU on site. The original mission at Rocky Flats was the manufacture of nuclear weapon components and the recovery and purification of plutonium scrap/residues for reuse. Its current mission activities include special nuclear materials stabilization; packaging and consolidation; deactivation and decommissioning of facilities; environmental restoration; property disposition; and offsite shipment and waste disposition.

Los Alamos National Laboratory

The Los Alamos National Laboratory in Los Alamos, New Mexico, has approximately **3.5** MTU on site. The HEU material at Los Alamos is in various physical and chemical forms, including pure metal, fabricated weapon shapes, and compounds. The HEU is used in basic special nuclear material research in support of national defense and energy programs.

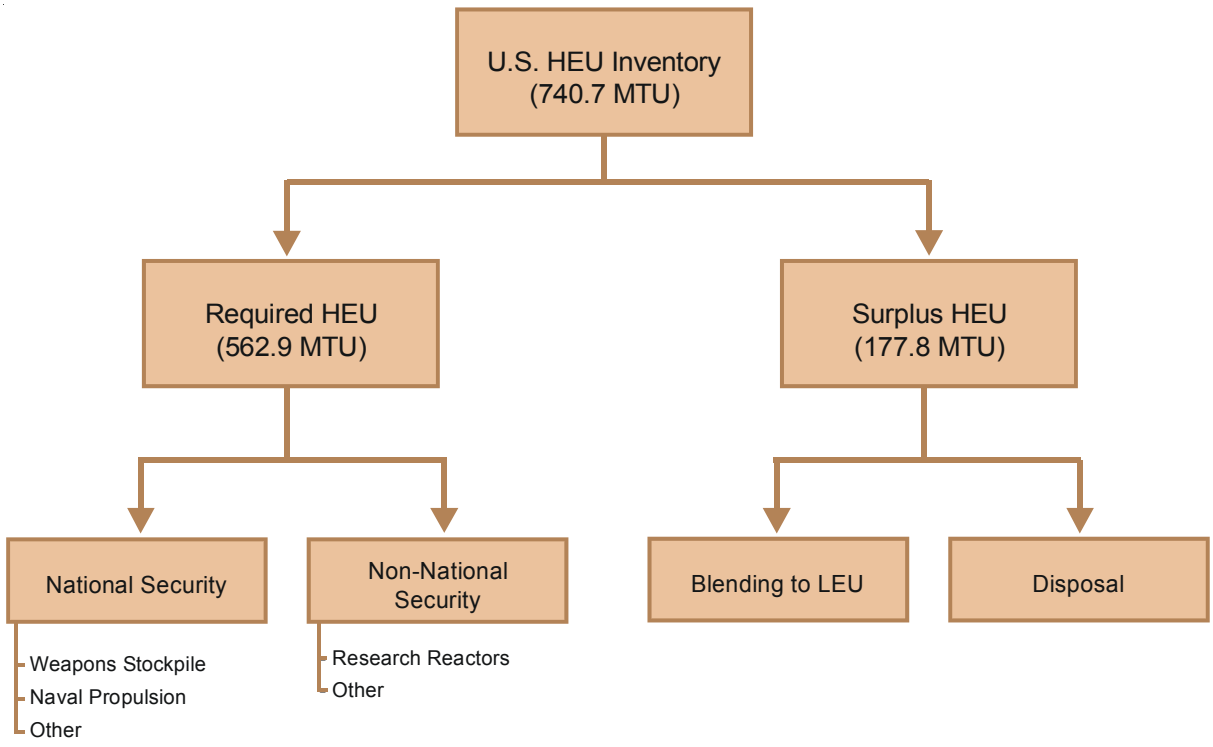
Other Sites with Small HEU Holdings

The remaining **8.3** MTU is located at other DOE sites as well as commercial facilities. This HEU material is in the form of reactor fuel plates, pure and impure oxides, solutions, calibration standards, sources, spent fuel, and other items. Site inventories range from gram quantities to approximately 1.6 MTU at the Oak Ridge National Laboratory.

HEU Programmatic Requirements

From a programmatic perspective, the U.S. HEU inventory can be divided into two categories—required HEU and surplus HEU. As shown in **Figure 3-1,** a total of **562.9** MTU is required HEU and a total of **177.8** MTU is surplus HEU. Required HEU is defined in this report as material that is currently in active use or planned future use for weapons and nonweapons programs. Surplus HEU is no longer required by the DOE and is planned for disposition either through blending or disposal operations.

Figure 3-1 U.S. HEU Inventory Categories as of September 30, 1996



REQUIRED HEU

As of September 30, 1996, the total quantity of required HEU in the U.S. HEU inventory was **562.9** MTU **(Table 3-2).** The required HEU is needed to support national security and non-national security programs.

Required HEU Inventory

Location	*MTU*
Y-12 Plant, Pantex Plant & Department of Defense	548.8
Idaho National Engineering & Environmental Laboratory	5.0
Rocky Flats Environmental Technology Site	3.8
Los Alamos National Laboratory	2.9
Other	2.4
Total	562.9

NATIONAL SECURITY

National security programs include the nuclear weapons stockpile, the Naval Nuclear Propulsion Program, and other national security programs.

NUCLEAR WEAPONS STOCKPILE

The U.S. nuclear weapons stockpile, America's strategic nuclear deterrent, along with appropriate defensive capabilities will remain at the core of U.S. national security. On August 11, 1995, President Clinton stated, "As part of our national strategy, the United States must and will retain strategic nuclear forces sufficient to deter any future hostile foreign leadership with access to strategic nuclear forces from action against our vital interests and to convince it that seeking a nuclear advantage would be futile."

As a result of this policy, HEU is required for nuclear weapons as part of the Stockpile Stewardship Program and includes research and development and surveillance activities to assure the long-term reliability of the stockpile.

NAVAL NUCLEAR PROPULSION PROGRAM

All U.S. Navy nuclear powered warships currently use reactors fueled by HEU. Unlike commercial power reactors, which are incrementally refueled, naval reactor cores are completely replaced when the operation of a reactor becomes inefficient. At the end of a core life, the core is removed from the ship and sent to the Expended Core Facility (ECF) at INEEL for examination.

Since the U.S. has ceased production of HEU, the future source of HEU for naval reactors will come from weapons returns and existing inventories. Based on current available inventory of material not in cores, uranium from weapons returns will be needed in the near future to continue to build naval cores. This process of turning former nuclear weapons into naval cores supports

the U.S. nonproliferation policy, since this material will eventually become spent naval fuel, which will not be available for future weapons use.

OTHER NATIONAL SECURITY

HEU is also required to support other national security programs including the Advanced Test Reactor operations at INEEL, future naval reactor requirements, and strategic reserves of HEU.

NON-NATIONAL SECURITY

HEU is required to support fuel fabrication for DOE non-weapons research reactors (e.g., High Flux Isotope Reactor, High Flux Beam Reactor, and the Brookhaven Medical Research Reactor), and the Department of Commerce's National Institute of Standards and Technology research reactor. These reactors are planned to operate for a minimum of ten more years. In addition, HEU is needed to support the DOE's University Reactor Fuel Assistance Program for fuel in university reactors (e.g., University of Missouri at Rolla reactor).

Table 3-2 Location of Required HEU Inventory as of September 30, 1996

Location	20 to <90% U-235		≥90% U-235		Total	
	MTU	MTU-235	MTU	MTU-235	MTU	MTU-235
Y-12 Plant, Pantex Plant & Department of Defense[a]					**548.8**	**498.3**
Idaho National Engineering and Environmental Laboratory	2.5	1.7	2.5	2.3	**5.0**	**4.0**
Rocky Flats Environmental Technology Site			3.8	3.6	**3.8**	**3.6**
Los Alamos National Laboratory	0.1	0.1	2.9	2.7	**2.9**	**2.7**
Sandia National Laboratory	0.1	0.1	0.4	0.4	**0.5**	**0.5**
Other	0.3	0.2	1.6	1.5	**1.9**	**1.7**
Total					**562.9**	**510.8**

Note: Totals may not add due to rounding.

a For purposes of national security, the HEU inventory for the Y-12 Plant, the Pantex Plant and the Department of Defense is a total combined quantity. As part of the Department of Defense inventory, the Naval Nuclear Propulsion Program includes HEU in nuclear-powered submarines, surface ships, and training platforms. In addition, this category includes the BWX Technologies Naval Nuclear Fuel Division facility, the Knolls Atomic Power Laboratory, the Bettis Atomic Power Laboratory, and the Expended Core Facility at the Idaho National Engineering and Environmental Laboratory. For purposes of national security, only the total quantities of uranium and uranium-235 are provided since the quantities in each assay range remain classified.

SURPLUS HEU

Surplus HEU Inventory (as of September 30, 1996)

Location	*MTU*
Y-12 Plant, Pantex Plant & Department of Defense	102.8
Idaho National Engineering & Environmental Laboratory	22.4
Savannah River Site	22.2
Portsmouth Gaseous Diffusion Plant	21.7
Rocky Flats Environmental Technology Site	2.2
K-25 Site	1.5
Oak Ridge National Laboratory	1.6
Other	3.4
Total	177.8

Over the years, the U.S. inventory has been used primarily for nuclear weapons production and other defense-related missions. With the end of the Cold War and resulting diminished strategic military threat, opportunities presented themselves for the DOE to redirect its HEU priorities from weapons production activities to HEU disposition activities. With the reduction in nuclear weapons, significant quantities of HEU became surplus to national defense needs.

On September 27, 1993, the President issued a Nonproliferation and Export Control Policy, which set forth the framework for U.S. efforts to prevent the proliferation of weapons of mass destruction. As a key element of the President's policy, the U.S. committed to eliminating, where possible, the accumulation of stockpiles of HEU and plutonium and to ensure that where these materials already exist, they are subject to the highest standards of safety, security, and international accountability.

In support of this policy, DOE and DoD performed an in-depth review of the fissile material required to support the nuclear weapons program and other national security needs. In December 1994, **174.3** MTU of HEU was declared surplus to national defense needs. In addition, the Secretary of Energy announced on December 20, 1994, that plutonium and weapons-usable HEU that was recovered during the cleanup of weapons complex facilities would be set aside as restricted-use material and not used for nuclear explosive purposes. On March 1, 1995, in a speech at the Nixon Center for Peace and Freedom, President Clinton stated: "To further demonstrate our commitment to the goals of the Treaty, today I have ordered that 200 tons of fissile material—enough for thousands of nuclear weapons—be permanently withdrawn from the United States nuclear stockpile. It will never again be used to build a nuclear weapon." The 200 tons of fissile material referred to by the President includes plutonium as well as HEU.

Information about the location, form, and quantity of the **174.3** MTU was released at the February 6, 1996, DOE Openness Press Conference. This release was based on the September 1995 HEU inventory. **Table 3-3** updates the location, form, and quantity of surplus HEU from **174.3** to **177.8** MTU. This revised quantity is based on the September 30, 1996, inventory.

As can be seen from Table 3-3, the amount of HEU that is surplus to national security has increased by 3.5 MTU. The location, quantities, and form of HEU in the U.S. inventory and, in particular, the quantity surplus to national security needs continues to be very dynamic. Reactor burnup, discards to waste, and the blending of HEU to LEU are continually reducing the HEU inventory. At the same time, the surplus inventory has increased with the receipt of HEU from foreign countries and changing DOE programmatic requirements. The location and forms of HEU have changed as a result of ongoing DOE facility and site cleanup, materials stabilization, and nonproliferation activities.

Table 3-3 Location of Surplus HEU Inventory as of September 30, 1996

Location	Metal	Oxides	Unirradiated Fuel	Irradiated Fuel	Other Forms	Total	
						MTU	MTU-235
Y-12 Plant, Pantex Plant and Department of Defense	84.2	6.4	10.1	0.1	2.0	**102.8**	**59.1**
Idaho National Engineering and Environmental Laboratory	0.8	1.8	0.8	18.5	0.4	**22.4**	**15.3**
Savannah River Site	6.1	0.5	5.8	8.3	1.4	**22.2**	**14.6**
Portsmouth Gaseous Diffusion Plant		7.3			14.4	**21.7**	**14.1**
Rocky Flats Environmental Technology Site	2.1		0.1			**2.2**	**2.0**
K-25 Site					1.5	**1.5**	**0.8**
Oak Ridge National Laboratory		1.0		0.6		**1.6**	**1.3**
Los Alamos National Laboratory		0.3			0.3	**0.6**	**0.5**
Hanford Site		0.1	0.1	0.2	0.1	**0.5**	**0.2**
Brookhaven National Laboratory				0.3		**0.3**	**0.2**
Sandia National Laboratory		0.1		0.1		**0.2**	**0.1**
Other				0.8	1.0	**1.8**	**1.3**
Total MTU	**93.2**	**17.6**	**17.0**	**28.9**	**21.1**	**177.8**	**109.5**
Total MTU-235	**56.9**	**9.4**	**8.7**	**19.3**	**15.2**		

Notes:

1 Quantities are in metric tons of uranium (MTU) and metric tons of uranium-235 (MTU-235).

2 Totals may not add due to rounding.

3 Information is based on the September 30, 1996, HEU inventory.

Relative to surplus HEU, the mission of the DOE Office of Fissile Materials Disposition is to support nonproliferation objectives making the material nonweapons-capable. In the Record of Decision for the Disposition of Surplus Highly Enriched Uranium issued on July 29, 1996, DOE decided to convert the surplus HEU into a nonweapons-capable material by down blending the HEU to LEU. The LEU will subsequently be provided to the commercial nuclear reactor industry as a source of fuel (in an effort to maximize the economic benefit of the material), or if that is not possible, be disposed of as low-level radioactive waste (DOE 1997).