Military Nuclear Wastes in the United States

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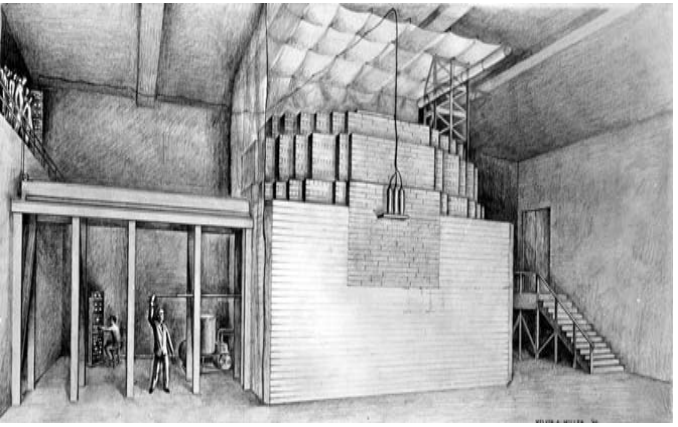
The Manhattan Project

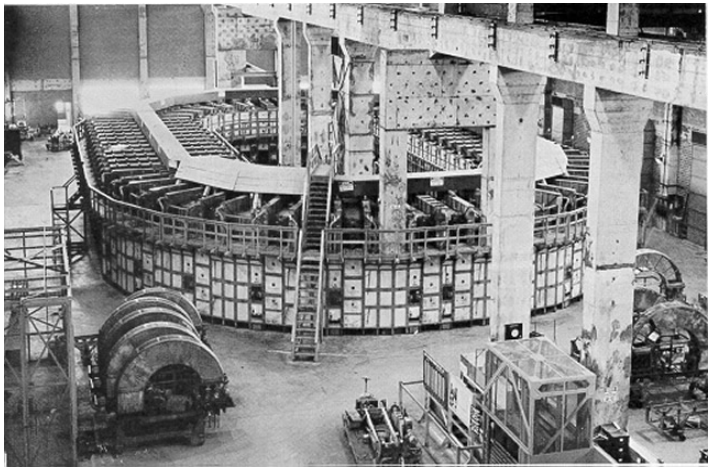


Chicago Pile December 1942

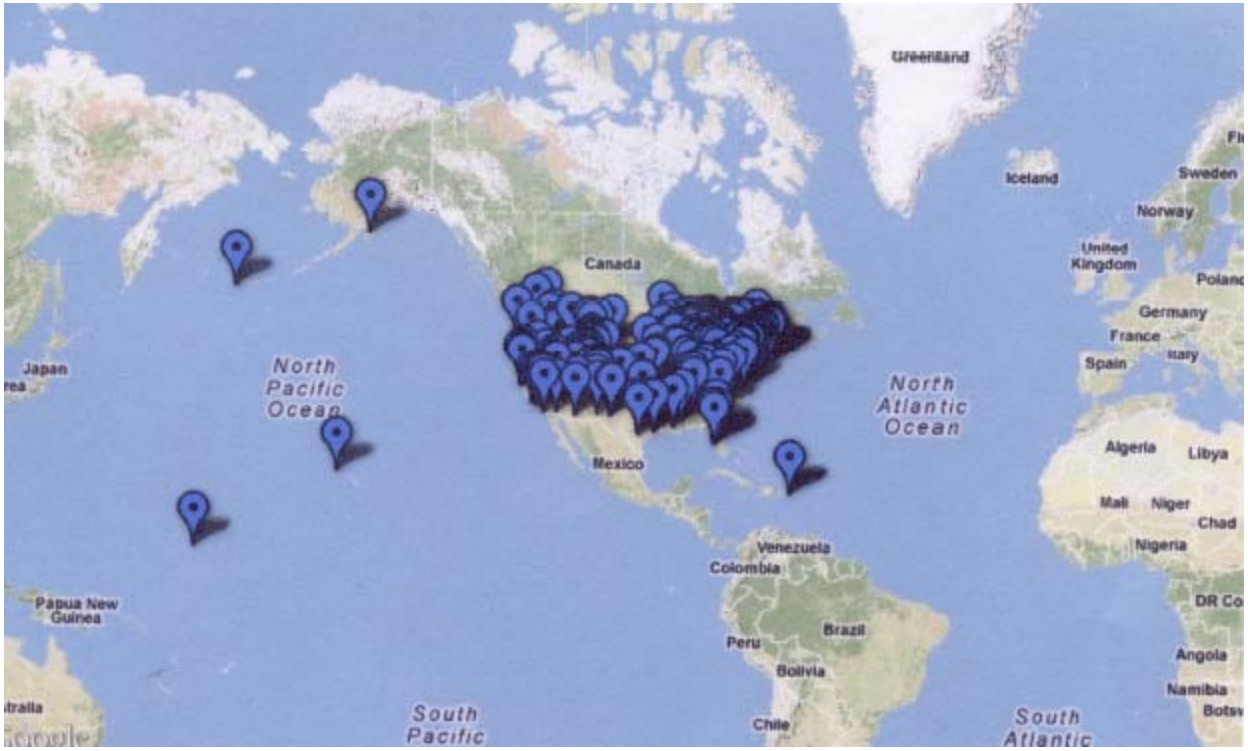
Hanford B Reactor 1945

Atomic Bomb over Nagasaki 1945

Robert Oppenheimer and Leslie Groves



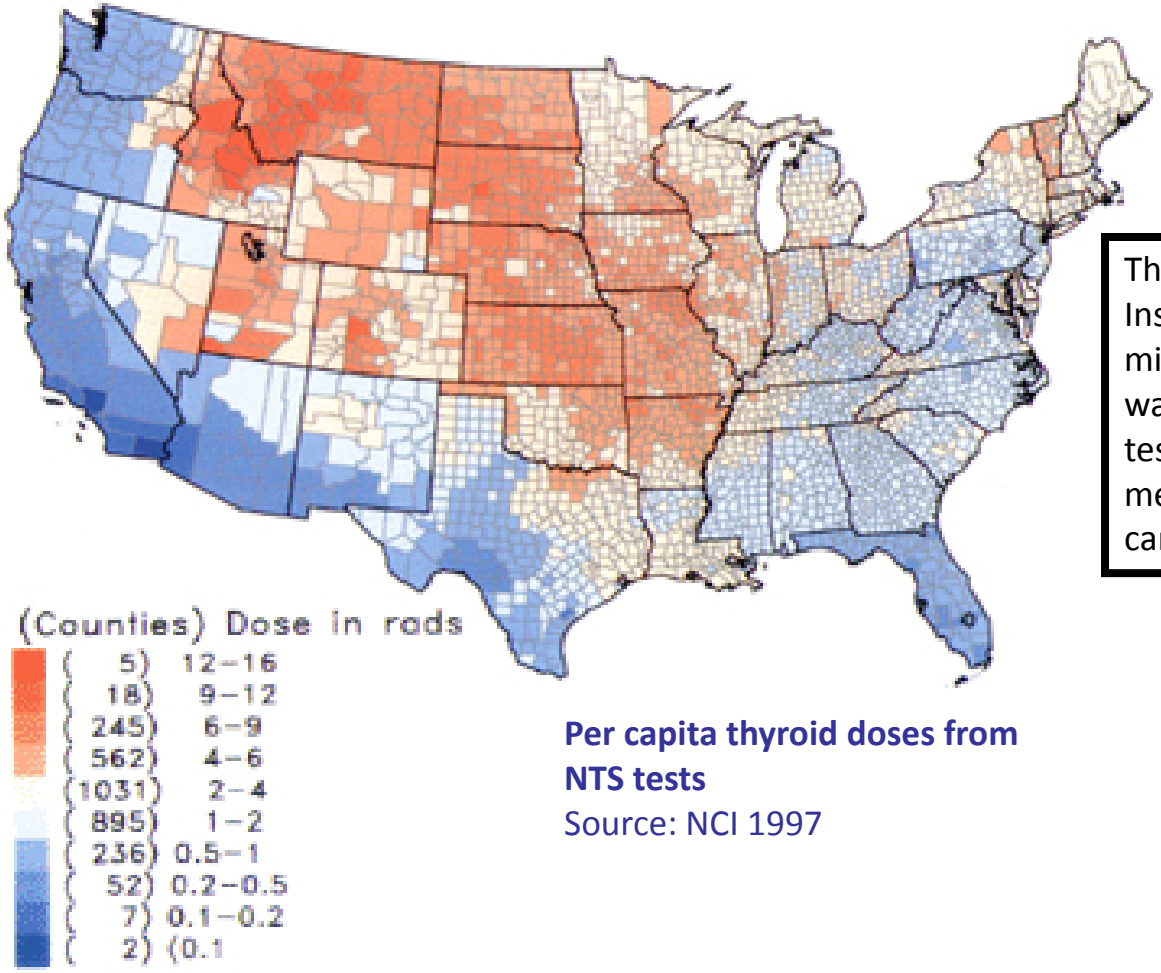
Uranium Calutron at Y-12



Between 1940 and 1990 research, development, testing and production of nuclear weapons at thousands of sites in nearly every state, as well as Puerto Rico, the Marshall Islands, Johnston Atoll and Christmas Island in the Pacific.

The total estimated cost for U.S. nuclear weapons from 1940 to 1996 was $5.8 trillion.

Bomb testing and Radioactive Fallout



Per capita thyroid doses from NTS tests
Source: NCI 1997

The U.S. National Cancer Institute estimates that 150 million curies of iodine -131 was released from Nevada tests; and might cause a median of 75,000 excess cancers.

RADIOACTIVE WASTES OF THE NUCLEAR WEAPONS COMPLEX

- OVER 2 MILLION CUBIC METERS OF RADIOACTIVE WASTES, INCLUDING LOW-LEVEL, MIXED, TRANSURANIC AND OTHER TYPES.

- ABOUT 100 MILLION GALLONS OF HIGH-LEVEL RADIOACTIVE WASTES LEFT IN AGING TANKS LARGER THAN MOST STATE CAPITOL DOMES. MORE THAN A THIRD OF SOME 200 TANKS HAVE LEAKED AND THREATEN WATER SUPPLIES SUCH AS THE COLUMBIA RIVER.

- HUNDREDS OF RADIATION-CONTAMINATED STRUCTURES, SUCH AS REACTORS, URANIUM ENRICHMENT PLANTS, RADIO-CHEMICAL PROCESSING AND STORAGE FACILITIES AND LABORATORIES.

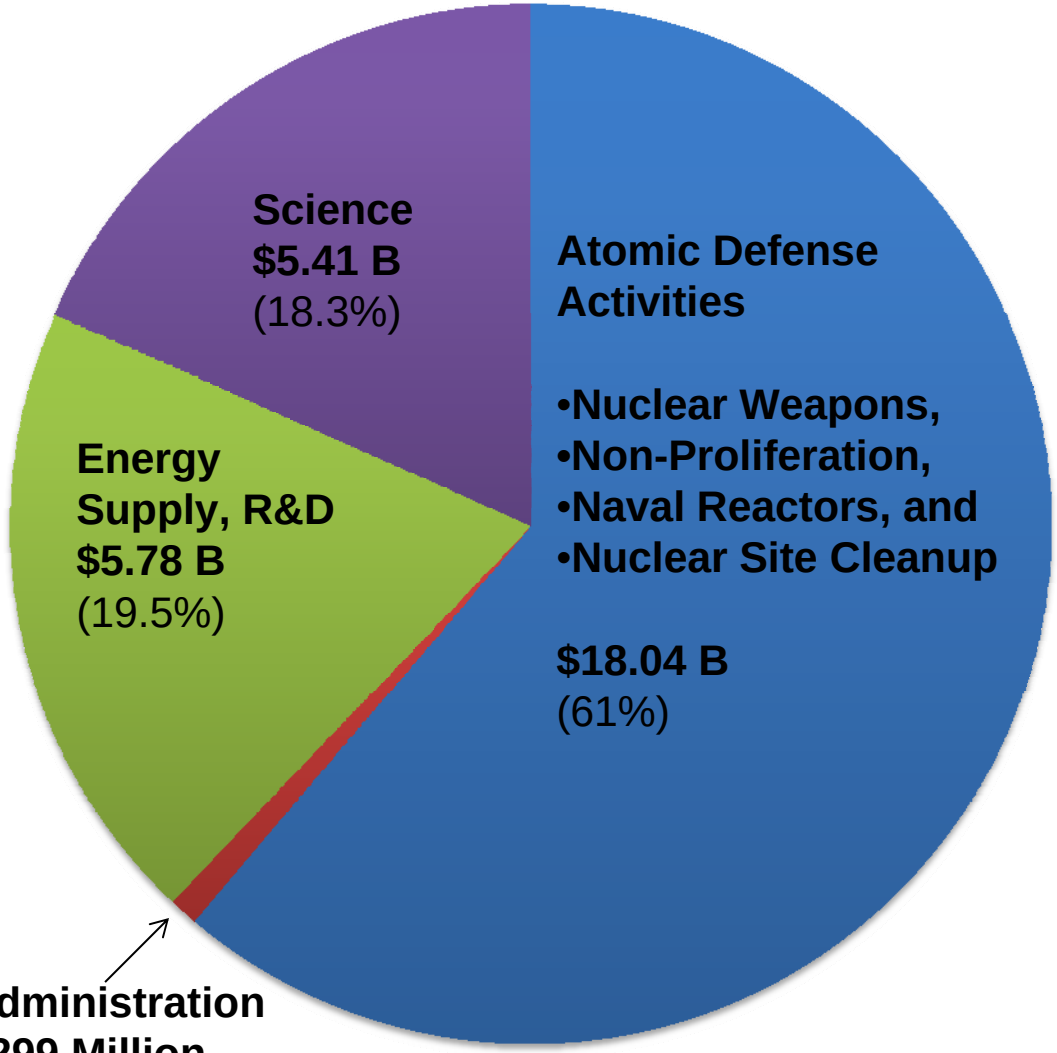
- ABOUT 20 MILLION TONS OF URANIUM MILL TAILINGS WASTES AND THOUSANDS OF ABANDONED URANIUM MINES.

- ABOUT 3.7 BILLION CUBIC METERS OF CONTAMINATED SOIL AND GROUNDWATER AT FEDERAL NUCLEAR SITES AND OTHER LOCATIONS.

- OVER 730,000 TONS OF NUCLEAR PRODUCTION MATERIALS INCLUDING HUNDREDS OF TONS OF WEAPONS USABLE HIGHLY-ENRICHED URANIUM AND PLUTONIUM.

- WELL OVER 20,000 RADIOACTIVE SOURCES USED FOR MEDICINE, WASTE MANAGEMENT, INDUSTRIAL AND RESEARCH PURPOSES.

U.S. Department FY 2012 Budget Request



Energy Activities Include:

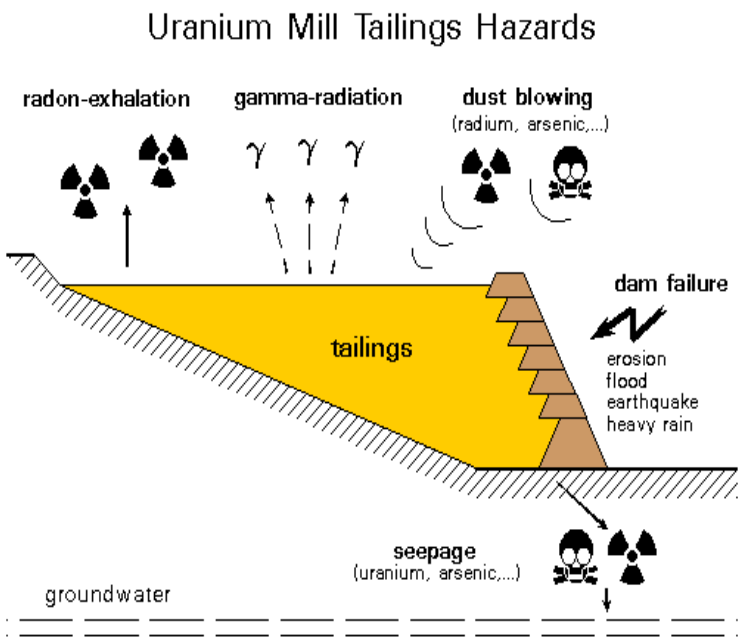
- Energy Efficiency and Renewable Energy: $3.2 Billion
- Fossil Energy: $520 Million
- Nuclear Energy (fission):$754 Million
- Electric Transmission: $123 Million
- Energy Information Administration: $123 Million
- Power Marketing Administrations: $85 Million
- Energy Loan Guarantees (subsidy costs): $305 Million

DOE Total Request= $29.5 Billion

DOE spends 10 times more on military nuclear activities than for energy conservation.

Uranium mining and Milling Wastes

Thousands of abandoned uranium mines mostly on Indian lands remain a very serious hazard. The mines expose to uranium through airborne dust and contaminated drinking water. Tribal people are by far the most vulnerable.



Uranium mill tailings are the largest volume radioactive waste produced in the nuclear fuel cycle. Approximately 25,000,000 tons were generated before 1970 mostly for nuclear weapons.

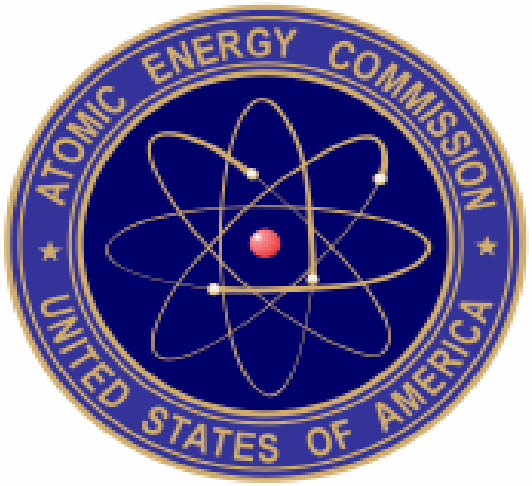
The Uranium Mill Tailing Remediation Action Program (UMTRAP)was established in 1978. Since that time, UMTRAP has conducted extensive remediation activities. The DOE UMTRAP project is the first large-scale program to conduct and complete remediation at nuclear legacy sites.

From the 1940s to 1970, nuclear wastes at U.S. weapons sites had varying and loosely defined classifications – allowing for direct shallow land disposal of large quantities of highly radioactive and long-lived radioisotopes.

At the DOEs Hanford site more than to 400 billion gallons of liquid wastes were dumped into the ground – enough to Create a poisonous lake the size of Manhattan Island over 80 feet deep.

In 1970 the AEC established its first formal classification system for nuclear wastes.

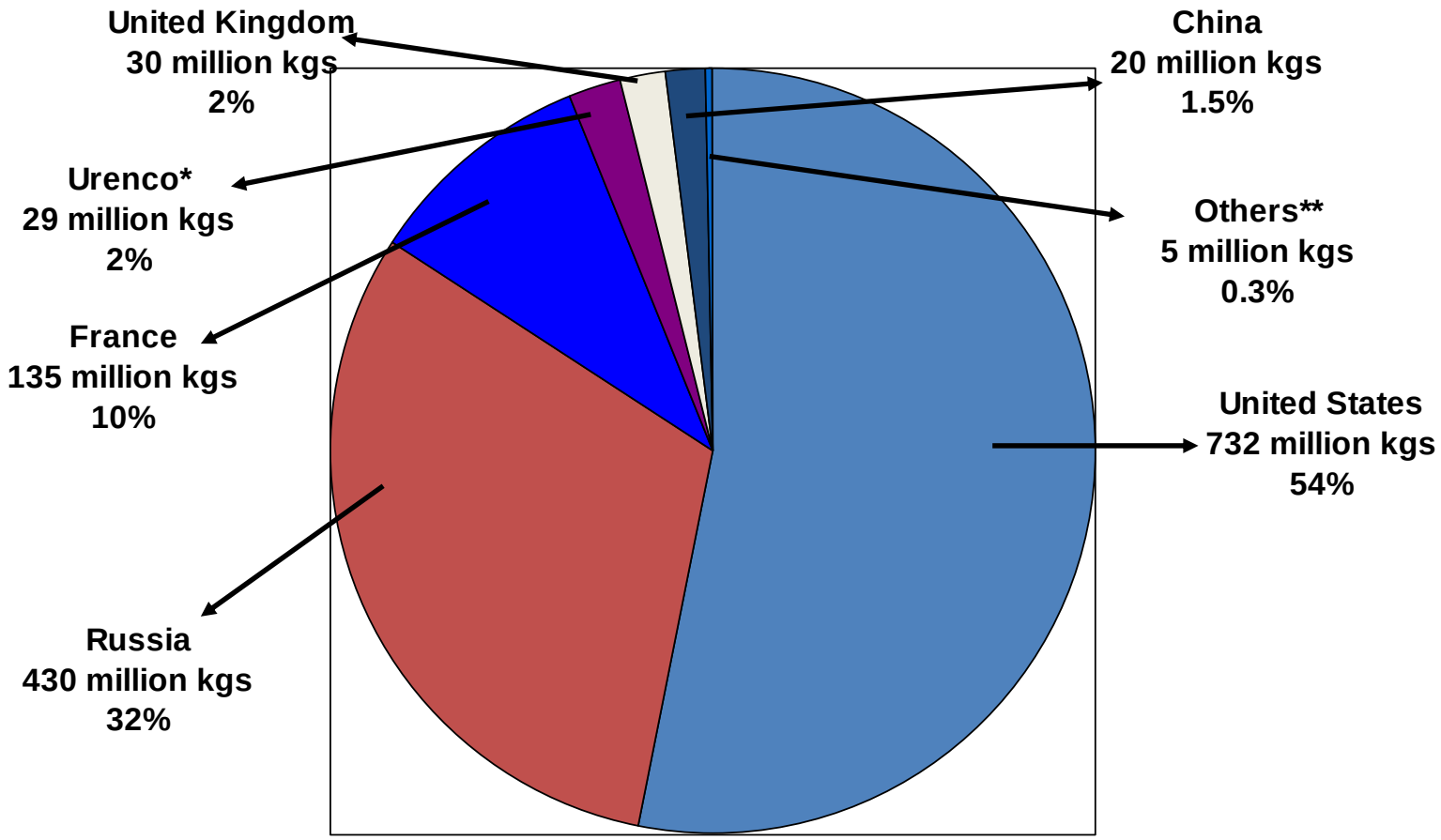
High-level radioactive wastes (HLW) was first defined by the AEC in terms of the source of the material in 10 CFR Part 50, Appendix F [3].



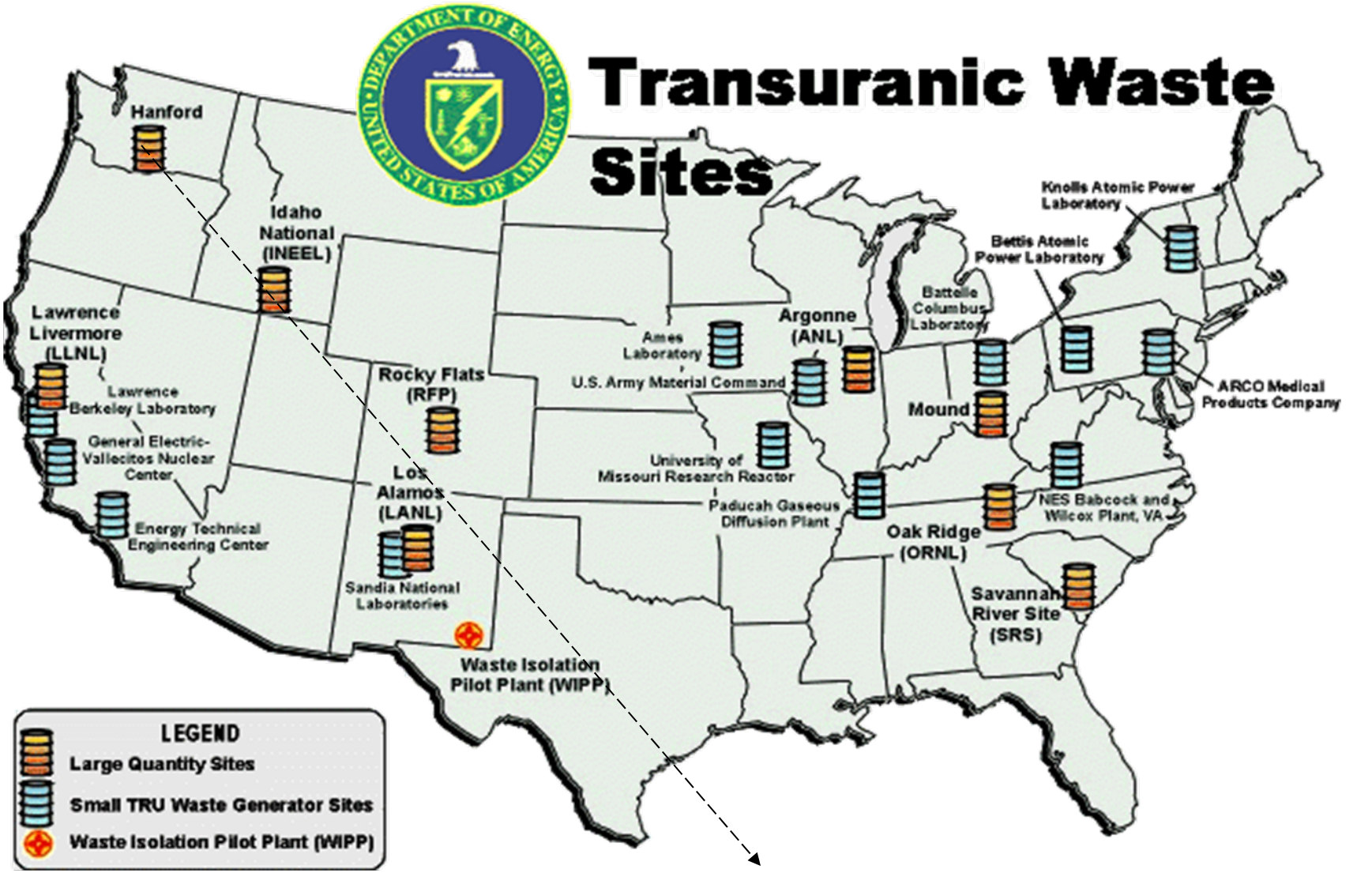
“those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent in a facility for reprocessing irradiated reactor fuels.”

In 1970 the AEC also decided to require disposal of plutonium or transuranic wastes (TRU – elements heavier than uranium) in a geologic repository designed to contain them for at least 10,000 years. Since 1970, pending deep disposal, U.S. TRU wastes have been stored in retrievable interim-storage containers.

The United States has the Word's Largest Inventory of Depleted Uranium



Depleted uranium hexafluoride now sits in some 55,000 steel cylinders, each weighing about thirteen tons, stacked in huge piles outside the enrichment plants.



Hanford has about 60 percent of all TRU wastes by volume.

Table 1 Total Volume and Radioactivity of Previously Disposed TRU-Contaminated Waste

Site	Volume (Cubic meters)	TRU Activity
Idaho National Engineering Laboratory	36,800	297,000 Ci
Hanford Site (DOE)	75,800	60,000 Ci
U.S. Ecology	5,097	42,800 Ci
Los Alamos National Laboratory	8,620	21,000Ci
Savannah River Site	4,530	18,500 Ci
Oak Ridge Reservation	7,450	1,966 Ci
Nevada Test Site	116	493 Ci

Sources: DOE 2001, NRC 1980, DOH 2004

Prior to 1970, approximately 2 metric tons of plutonium was disposed through shallow burial – enough to fuel ~8,000 atomic bombs.

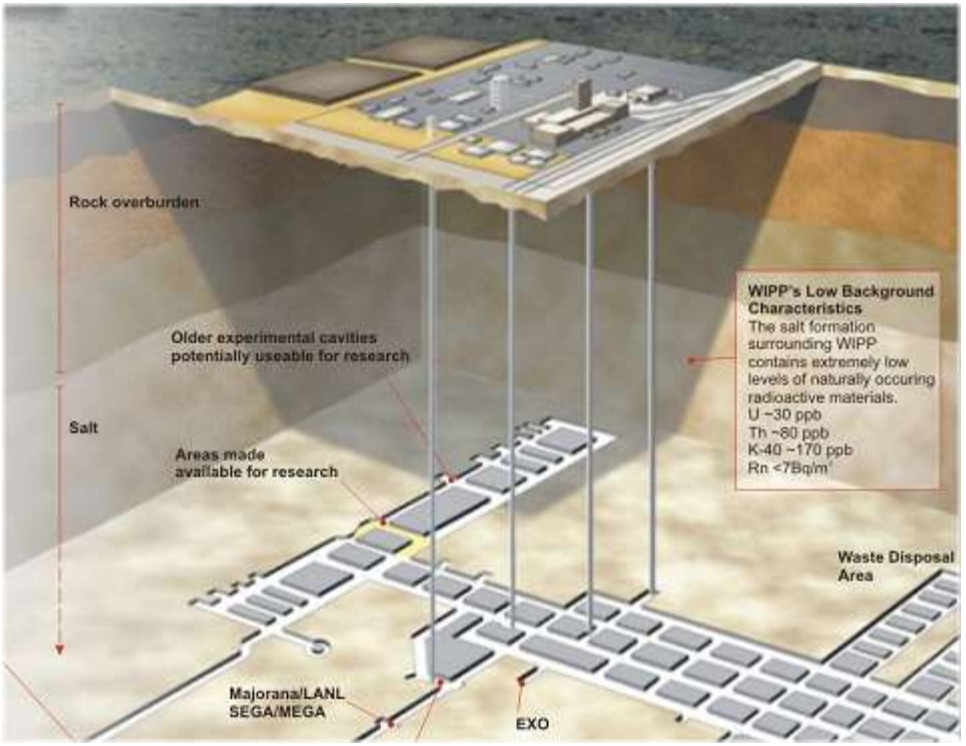
The Waste Isolation Pilot Project (WIPP) in New Mexico

WIPP was first proposed in 1970
And opened in 1998.

By virtue of its dominance WIPP is a plutonium disposal repository.

As of 2009, WIPP was projected to contain nearly 8 metric tons of plutonium – nearly half which was set aside for use in weapons.

WIPP is being eyed in Congress and DOE for disposal of military high-level wastes and excess plutonium.



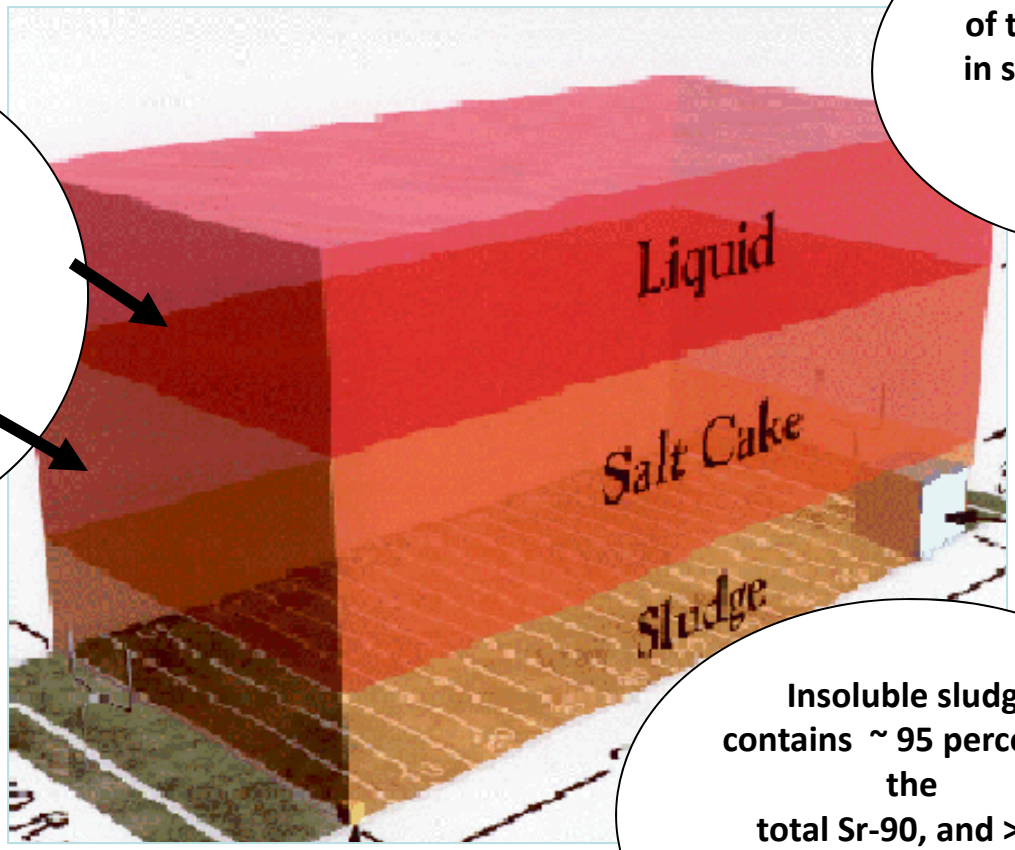
Hanford high-level waste tanks
under Construction

In 1957 the National Academy of Sciences warned that high-level radioactive wastes from plutonium production at Hanford "[t]he hazard related to radioactive waste is so great that no element of doubt should be allowed to exist regarding safety.“

That same year the academy recommended that the U.S. government establish deep geologic disposal as the best solution to the problem.

Hanford High-Level Wastes

Soluble wastes are ~ 80 percent of volume and contain ~50 percent of the total radioactivity.

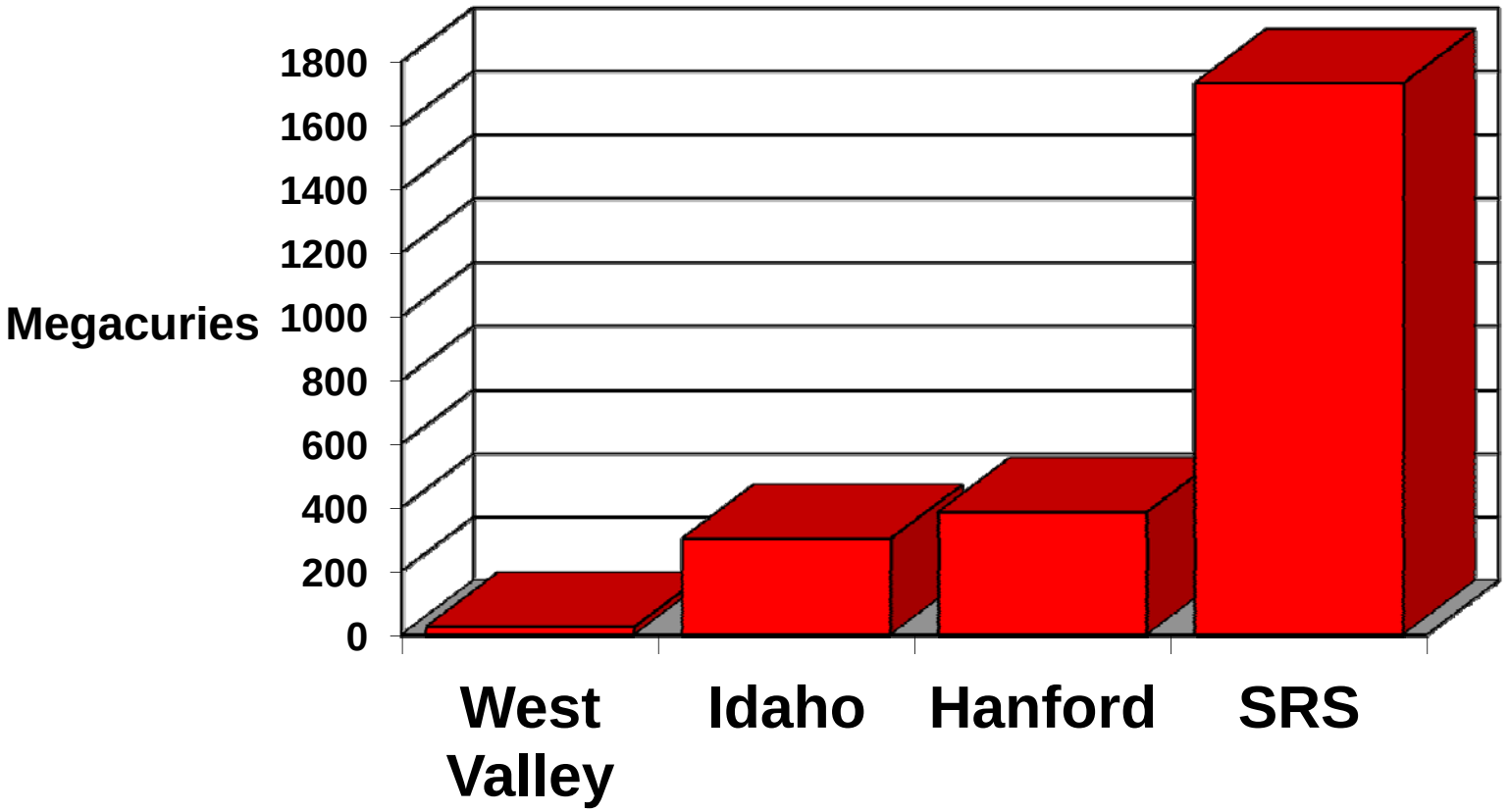


About 96 percent of the radioactivity in soluble wastes is cesium-137.

Insoluble sludge contains ~ 95 percent of the total Sr-90, and > 90 percent of the total transuranics.

Adapted from:
DOE/RL-98-34

Radioactivity in DOE High-Level Wastes

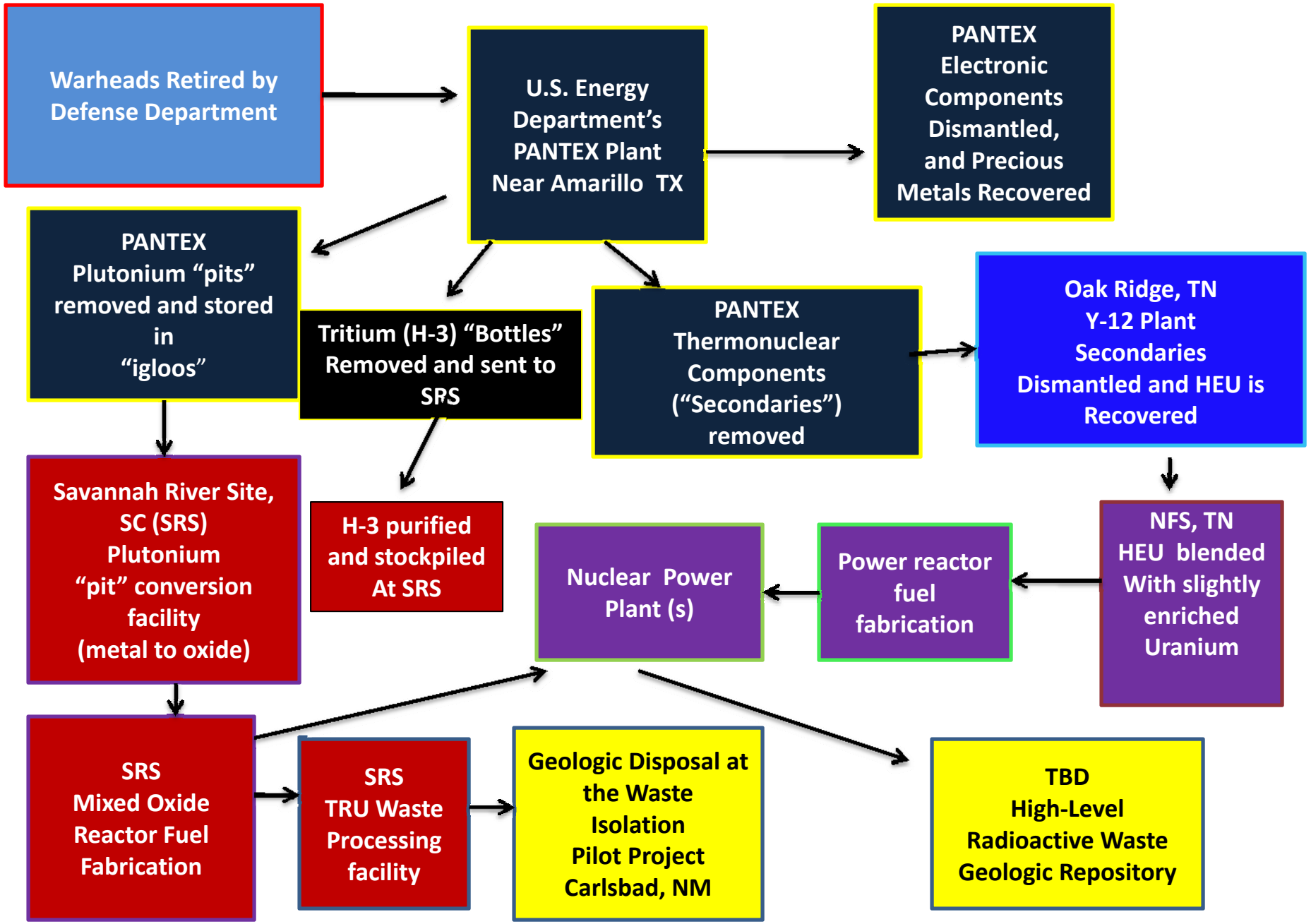


According to DOE, treatment and disposal will cost more than $120 billion; and after 30 years, the Energy Department has processed less than five percent of these wastes for disposal.

At the Nevada National Security Site (formerly the Nevada Nuclear Test Site) the U.S. detonated 1021 nuclear weapons, of which 921 were underground.

As of 1992, the underground shots released about 300 million curies of radioactive materials— making it the most radioactively contaminated area in the country.

Current Flow Sheet for Eliminating Nuclear Weapons In the U.S.



Excess Plutonium

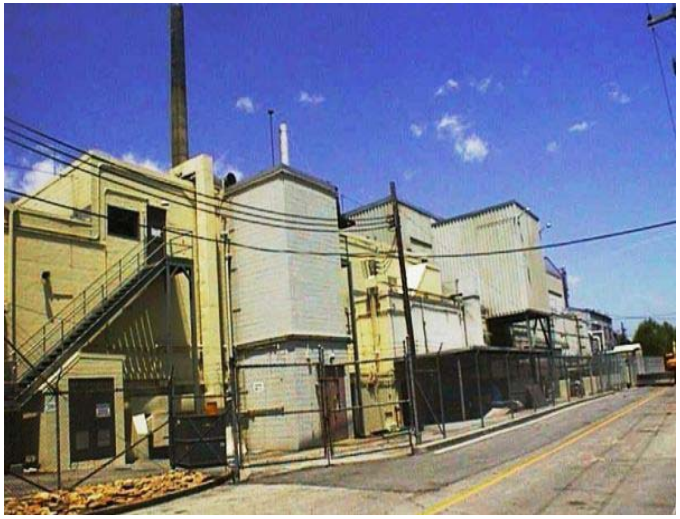
Since the end of the Cold War the U.S. declared 49.3 metric tons of plutonium was no longer needed . Of that 34 MT came from nuclear weapons.

The current program is to convert approximately 42.3 metric tons (MT) of plutonium into mixed oxide (MOX) nuclear fuel for commercial nuclear power plants.

This project is estimated to cost nearly $5 billion to construct and is not likely to begin operation until the late 2020's.

DOE is also considering disposing more excess plutonium in WIPP.

Uranium 233



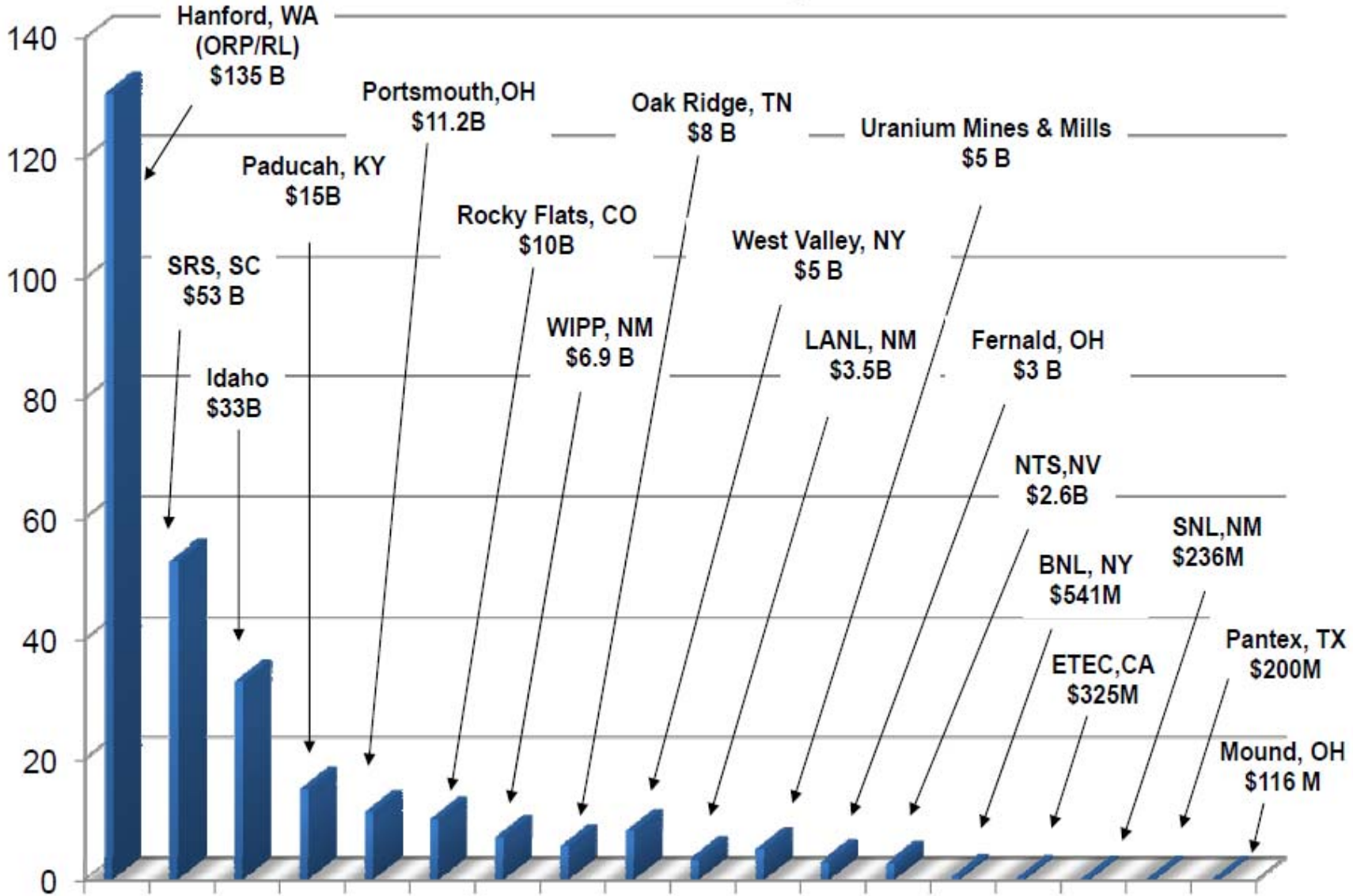
Building 3019 at ORNL

The U.S. produced about 2 metric tons of U-233 costing $5 to $11 billion. About 428 kilograms are stored in a 69-year-old building that does not meet DOE security requirements.

U-233 is classified as a Category I special strategic nuclear material, which "in specified forms and quantities — can be used to construct an improvised nuclear device capable of producing a nuclear explosion."

The Energy Department plans to dispose most of its concentrated U-233 in a landfill in significant violation of its security and radioactive waste disposal requirements, as well as international requirements and norms.

DOE Site Cleanup Costs*



Sources. DOE 2008, GAO 2005, EIA 2006

Total Cost = $283 Billion

*Does not include NNSA projects

Conclusion

Nuclear weapons production has resulted in the most expensive, Complex and risky environmental clean up challenge in the United States

The U.S. nuclear weapons program is responsible for the greatest exposures to ionizing radiation to workers and the public in this country.

The volume and types of nuclear wastes are greater than those generated by commercial nuclear power in the U.S.

Contamination from nuclear weapon s production has created large profoundly contaminated "national sacrifice zones"

The military nuclear program is well on the path to leaving high-level and plutonium-contaminated wastes in shallow land burial.

The physical elimination of nuclear weapons has a very low priority In the U.S.