

The U.S. Department of Energy's Atomic Defense Budget for FY 2017

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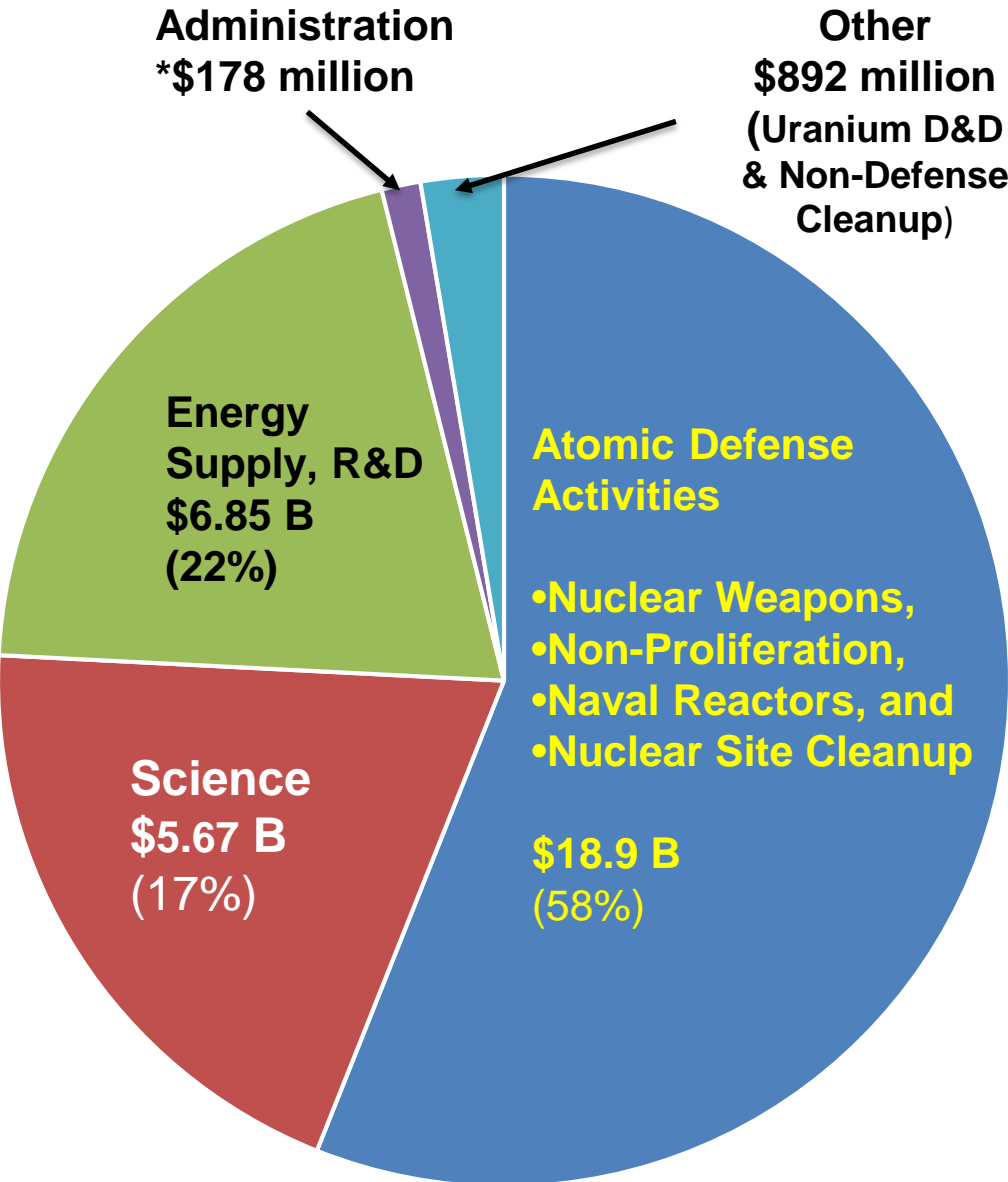
B-61 nuclear warheads



Radioactive waste container

U.S. Department of Energy FY 2017 Budget

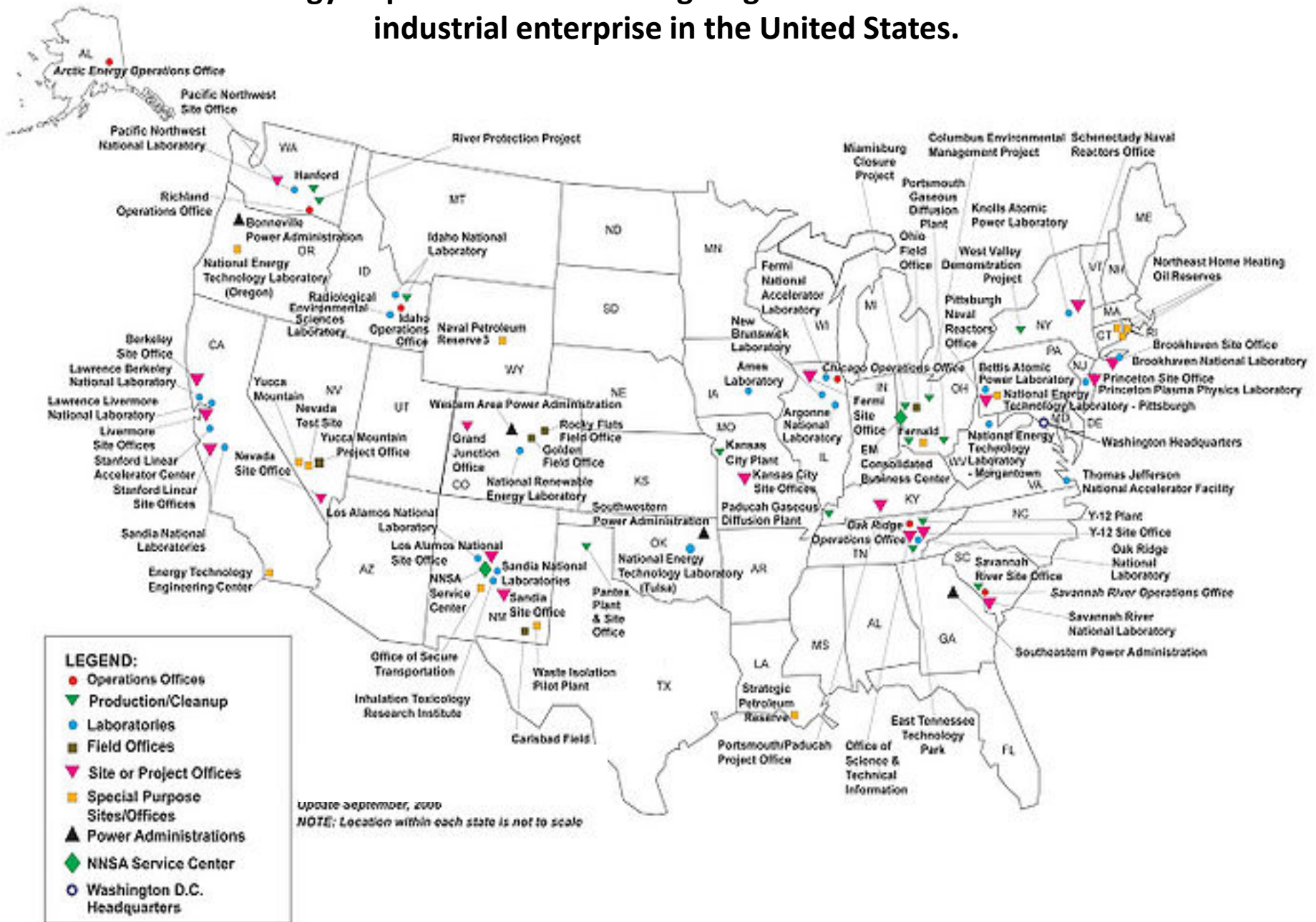
\$32.49 Billion



Energy Activities Include:

- Energy Efficiency and Renewable Energy: \$2.9 Billion
- Fossil Energy: \$638 Million
- Nuclear Energy (fission): \$994 Million
- Electric Transmission: \$263 Million
- Energy Information Administration: \$132 Million
- Power Marketing Administrations: \$84 Million
- Energy Loan Guarantees: \$5 Million
- 21st Century Transportation: 1.34 Billion
- Office of Indian Energy - \$22.9 Million

The U.S. Energy Department has the largest government-owned research and industrial enterprise in the United States.



Funding by Appropriation

Atomic Energy Defense Activities

National Nuclear Security Administration

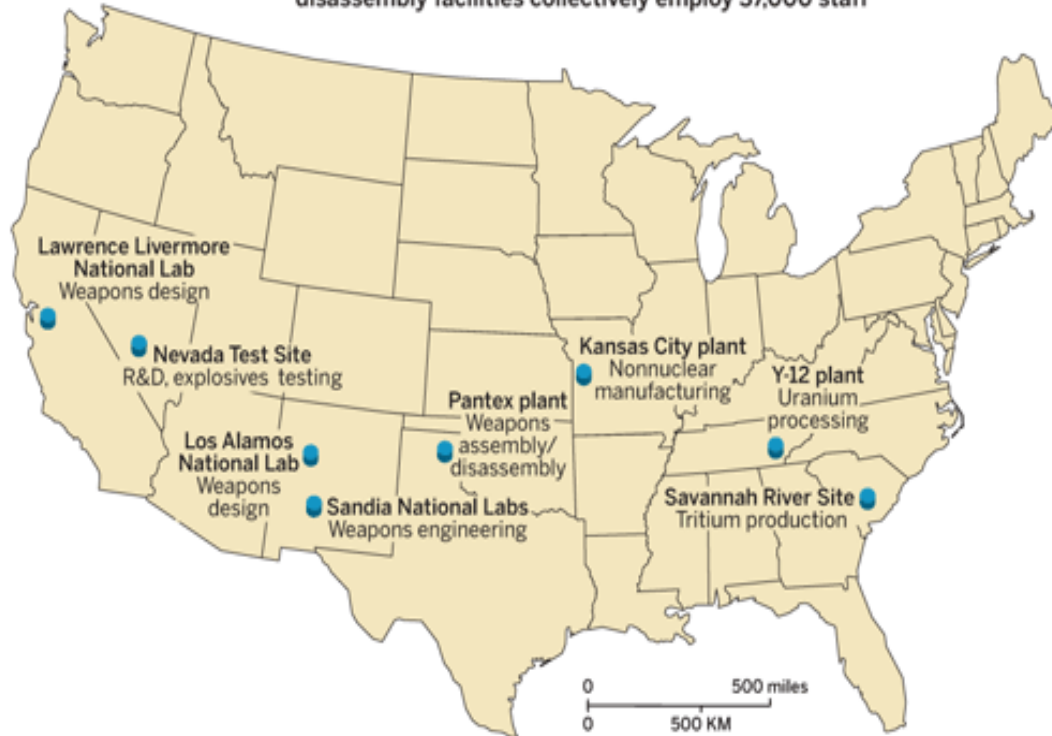
| | | | | | | |
|--|-------------------|-------------------|-------------------|-------------------|-----------------|--------------|
| Weapons Activities | 8,180,359 | 8,180,609 | 8,846,948 | 9,243,147 | +396,199 | +4.5% |
| Defense Nuclear Nonproliferation | 1,615,248 | 1,612,651 | 1,940,302 | 1,807,916 | -132,386 | -6.8% |
| Naval Reactors | 1,233,840 | 1,233,840 | 1,375,496 | 1,420,120 | +44,624 | +3.2% |
| Office of the Administrator | -413 | -413 | 0 | 0 | 0 | N/A |
| Federal Salaries and Expenses | 370,000 | 370,000 | 363,766 | 412,817 | +49,051 | +13.5% |
| Total, National Nuclear Security Administration | 11,399,034 | 11,396,687 | 12,526,512 | 12,884,000 | +357,488 | +2.9% |

Environmental and Other Defense Activities

| | | | | | | |
|--|-------------------|-------------------|-------------------|-------------------|-----------------|--------------|
| Defense Environmental Cleanup | 4,990,017 | 4,989,555 | 5,289,742 | 5,226,950 | -62,792 | -1.2% |
| Other Defense Activities | 753,449 | 753,449 | 776,425 | 791,552 | +15,127 | +1.9% |
| Total, Environmental and Other Defense Activities | 5,743,466 | 5,743,004 | 6,066,167 | 6,018,502 | -47,665 | -0.8% |
| Total, Atomic Energy Defense Activities | 17,142,500 | 17,139,691 | 18,592,679 | 18,902,502 | +309,823 | +1.7% |

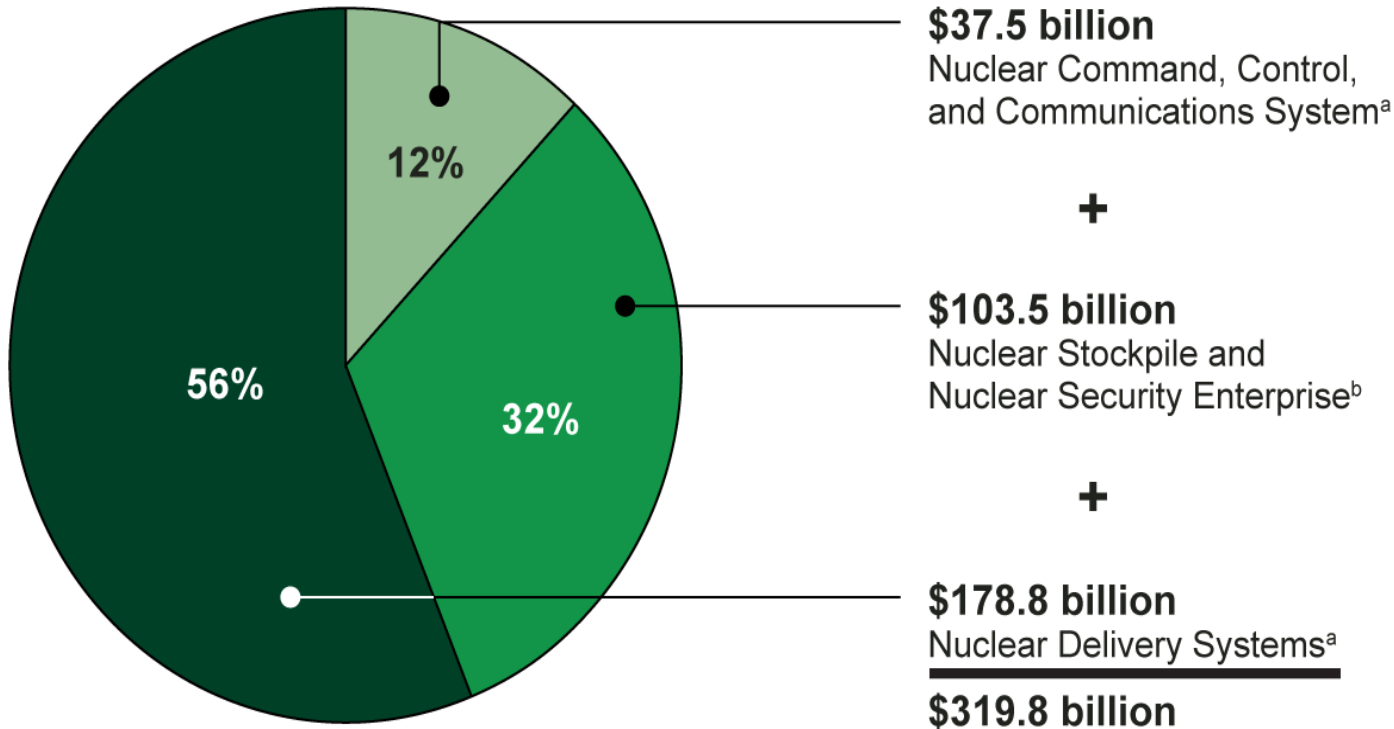
U.S. NUCLEAR WEAPONS COMPLEX

Three national labs and five manufacturing, assembly, and disassembly facilities collectively employ 37,000 staff



SOURCE: National Nuclear Security Administration

Estimated cost for U.S. nuclear weapons from FY 2015 to FY 2025

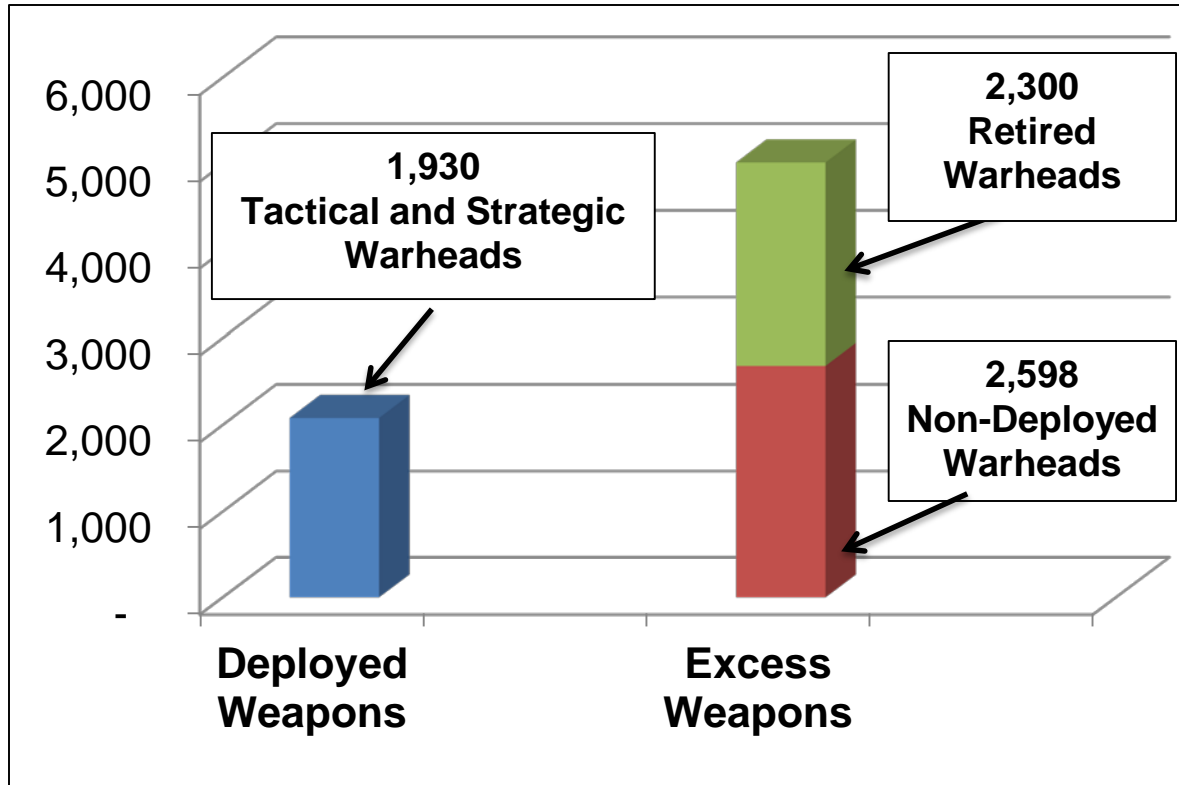


Source: GAO analysis of Department of Defense (DOD) and Department of Energy (DOE) data. | GAO-16-23

Over 30 years the cost for U.S. nuclear weapons modernization is estimated to cost up to \$1 trillion.

<http://www.nytimes.com/2016/01/12/science/as-us-modernizes-nuclear-weapons-smaller-leaves-some-uneasy.html>

The U.S. Nuclear Arsenal in 2016



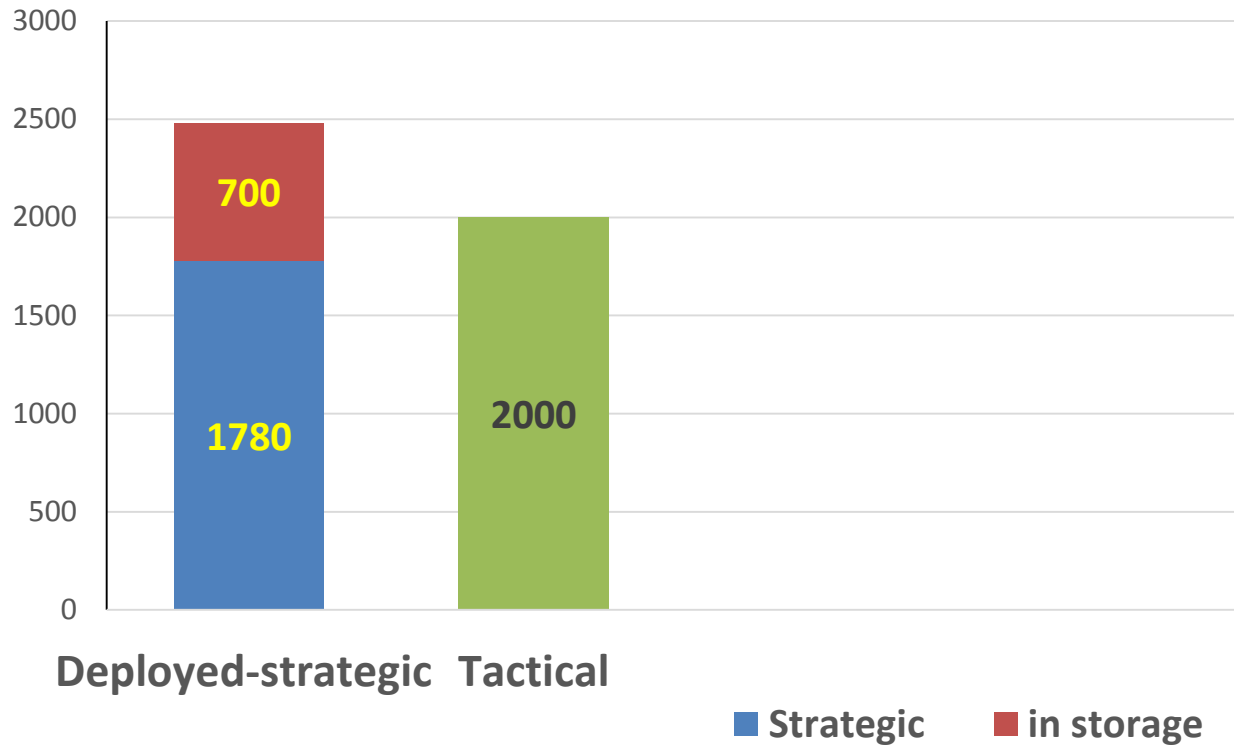
The U.S. nuclear stockpile has 400 times the destructive power of explosives used by all combatants in World War II.

About 70 percent of the U.S. nuclear arsenal is not deployed.

About one third has been discarded and is awaiting dismantlement.

The primary targets are mostly those selected during the Cold War, which ended 20 years ago.

Russian Nuclear Forces 2015



70 percent of Russia's Strategic warheads are deployed.

Russia maintains a large number of stand-by" tactical nuclear weapons to compensate for less conventional capabilities possessed by the U.S.

Russia's warheads have shorter life-spans and are Replaced more frequently than in the U.S.

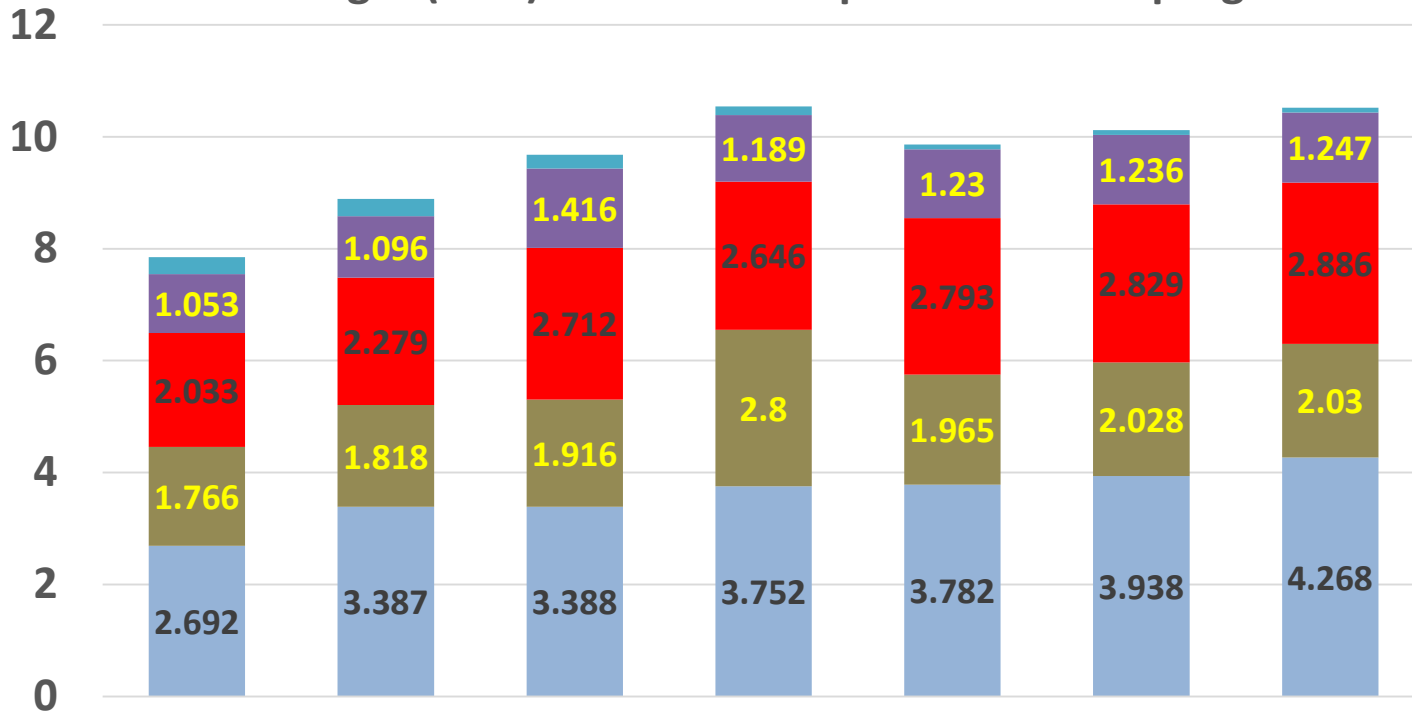
Russia has also embarked on a nuclear modernization program, the costs of which are not well known – but are believed to be limited due to declining oil revenues.

Source:

<http://thebulletin.org/2015/may/russian-nuclear-forces-20158299>

The single largest expense in the Energy Department budget (28%) is for the Weapons Activities program.

\$ Billions



Infrastructure and indirect costs consistently average 40% of total Weapons Activities annual budgets.

Five-year spending for Weapons Activities = \$67.3 billion
Or ~\$15 million per active warhead

- Directed Stockpile Work
- RDT&E
- Infrastructure and Operations
- Safeguards and Security
- Contractor Pensions

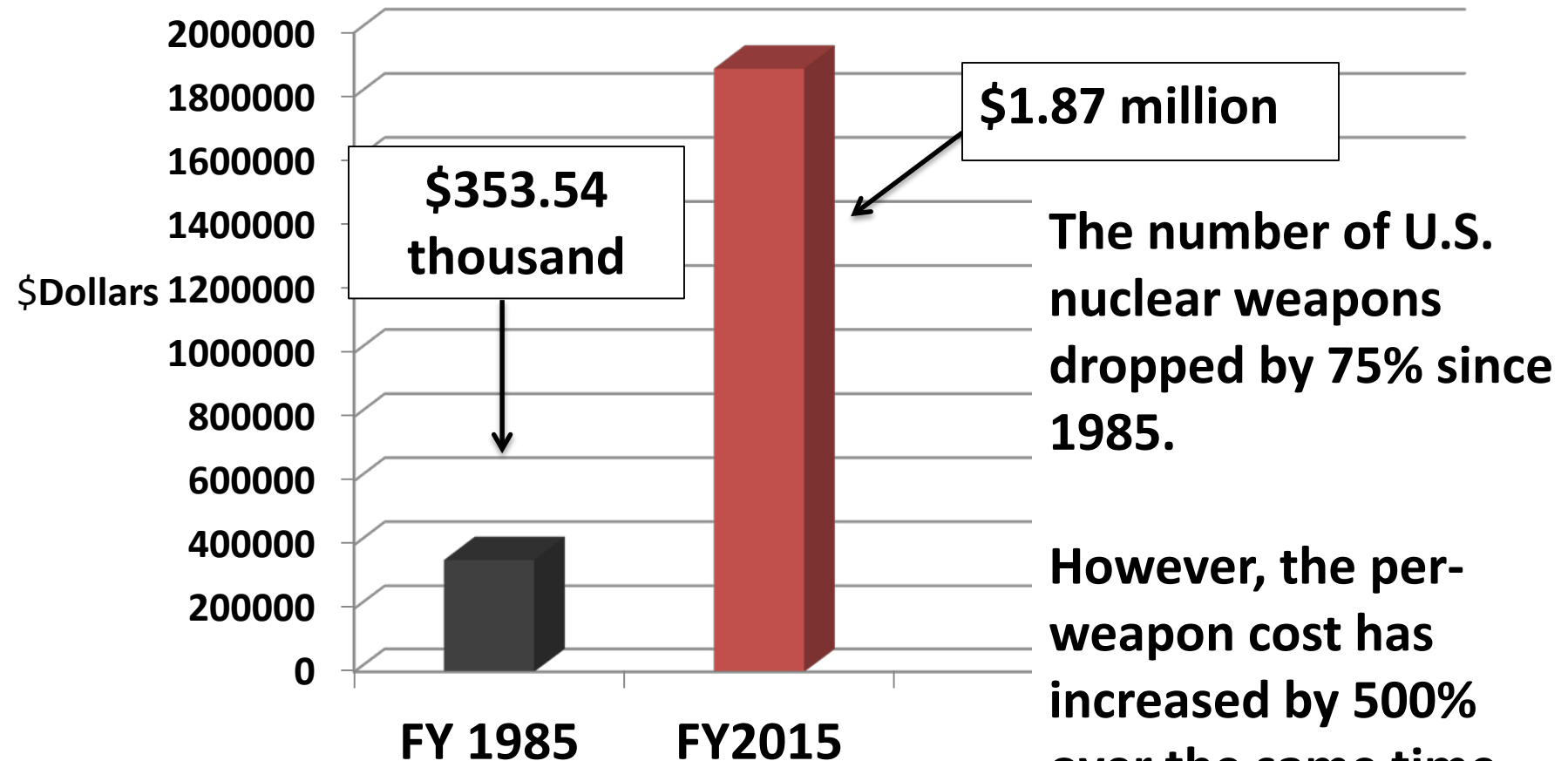
Current nuclear weapons and associated delivery systems

| <i>Warheads—Strategic Ballistic Missile Platforms</i> | | | | | |
|---|---|--|---------------------|-----------------------|-------------------------------|
| <i>Type ^a</i> | <i>Description</i> | <i>Carrier</i> | <i>Laboratories</i> | <i>Mission</i> | <i>Military</i> |
| W78 | Reentry vehicle warhead | Minuteman III Intercontinental Ballistic Missile | LANL/SNL | Surface to surface | Air Force |
| W87 | Reentry vehicle warhead | Minuteman III Intercontinental Ballistic Missile | LLNL/SNL | Surface to surface | Air Force |
| W76-0/1 | Reentry body warhead | Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile) | LANL/SNL | Underwater to surface | Navy |
| W88 | Reentry body warhead | Trident II D5 Strategic Weapon System (Submarine Launched Ballistic Missile) | LANL/SNL | Underwater to surface | Navy |
| <i>Bombs—Aircraft Platforms</i> | | | | | |
| <i>Type ^a</i> | <i>Description</i> | <i>Carrier</i> | <i>Laboratories</i> | <i>Mission</i> | <i>Military</i> |
| B61-3/4/10 | Non-strategic bomb | F-15, F-16, certified NATO aircraft | LANL/SNL | Air to surface | Air Force/ Select NATO forces |
| B61-7 | Strategic bomb | B-52 and B-2 bombers | LANL/SNL | Air to surface | Air Force |
| B61-11 | Strategic bomb | B-2 bomber | LANL/SNL | Air to surface | Air Force |
| B83-1 | Strategic bomb | B-52 and B-2 bombers | LLNL/SNL | Air to surface | Air Force |
| <i>Warheads—Cruise Missile Platforms</i> | | | | | |
| <i>Type ^a</i> | <i>Description</i> | <i>Carrier</i> | <i>Laboratories</i> | <i>Mission</i> | <i>Military</i> |
| W80-1 | Air-launched cruise missile strategic weapons | B-52 bomber | LLNL/SNL | Air to surface | Air Force |

LANL = Los Alamos National Laboratory
 LLNL = Lawrence Livermore National Laboratory
 NATO = North Atlantic Treaty Organization
 SNL = Sandia National Laboratories

^aThe suffix associated with each warhead or bomb type (e.g., “-0/1” for the W76) represents the modification associated with the respective weapon.

The Average Annual Cost for a Single Nuclear Weapon (FY 1985 & FY 2015)*



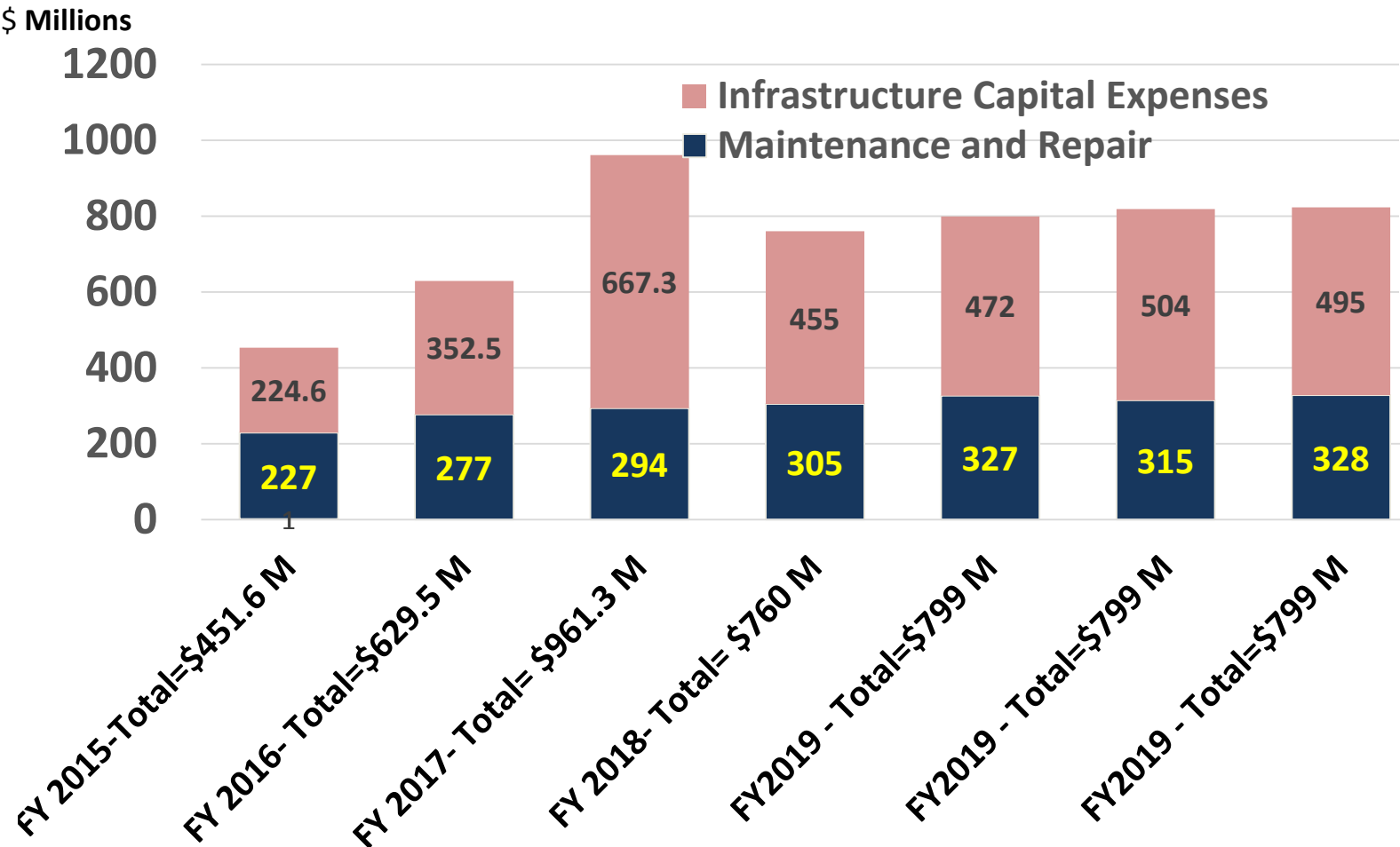
The number of U.S. nuclear weapons dropped by 75% since 1985.

However, the per-weapon cost has increased by 500% over the same time period.

Sources:, DOE FY 1985 and FY 2016 Budget Justifications, BAS
<http://bos.sagepub.com/content/early/2014/08/26/0096340214547619>
Nuclear Watch, <http://www.nukewatch.org/watchblog/?p=1709> , BAS,
<http://m.bos.sagepub.com/content/69/5/75.full.pdf>

* 2014 adjusted dollars.

The costs for keeping an aging, oversized nuclear weapons complex

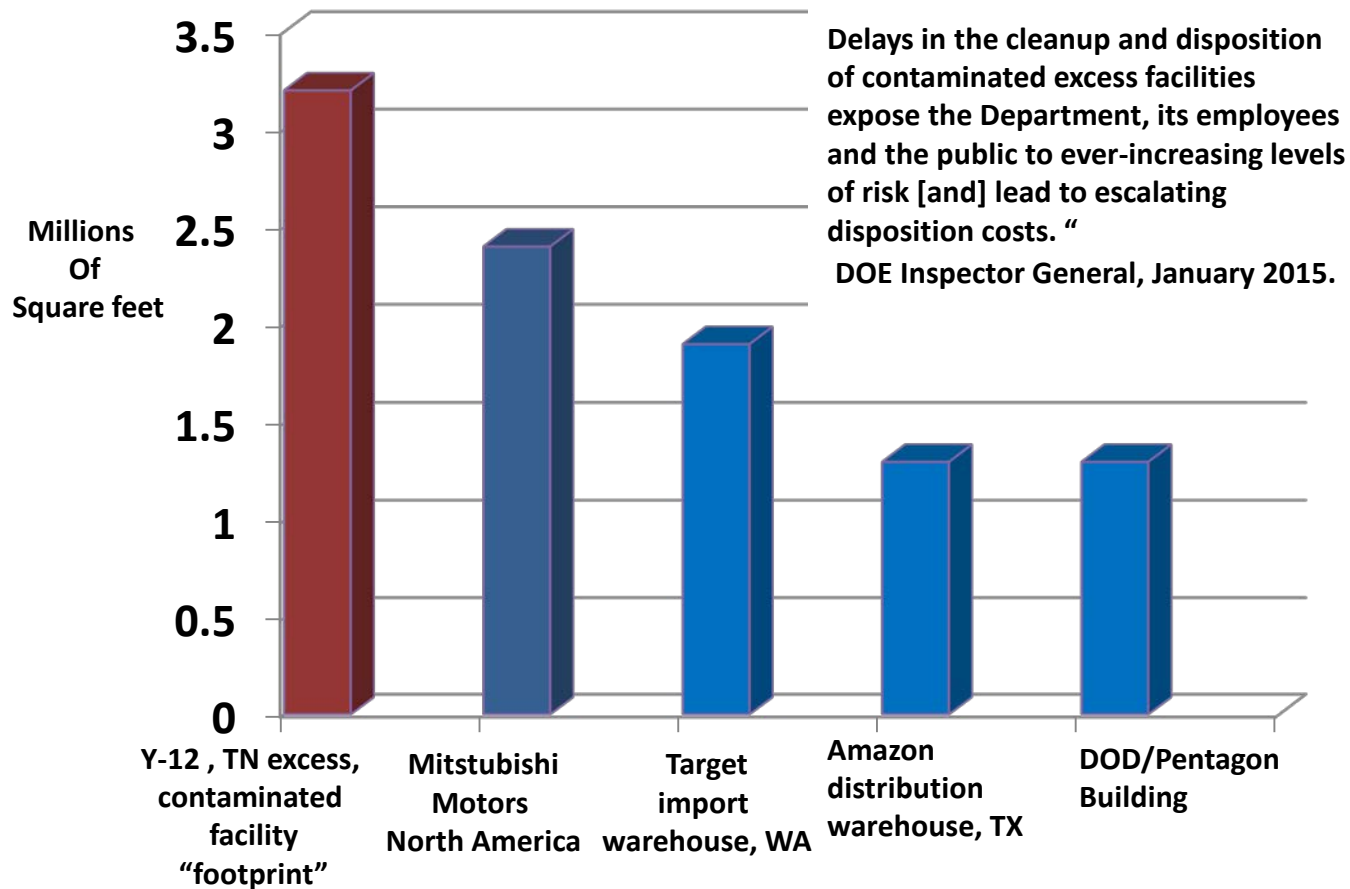


Five-year spending for existing infrastructure capital expenses = \$3.17B

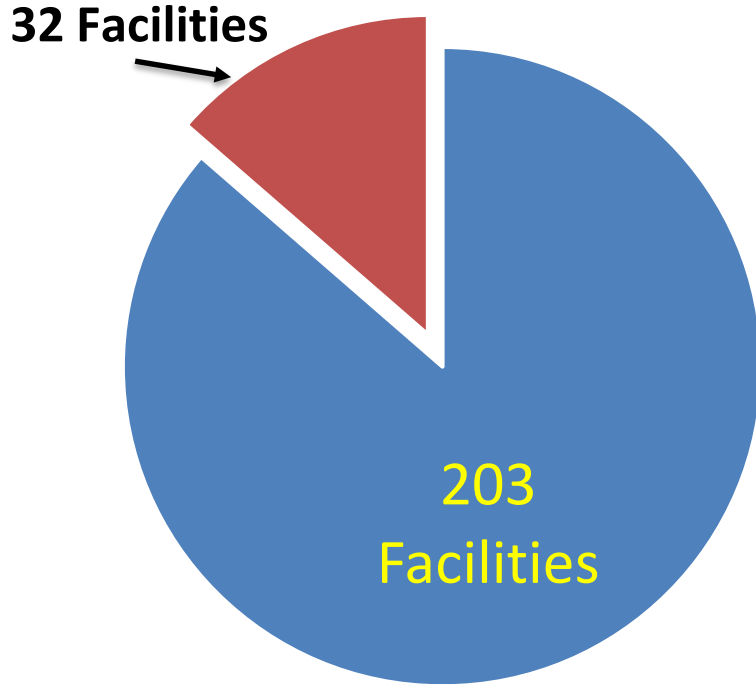
Five-year spending for Maintenance & Repair = \$2.07 B

Five year total cost is \$5.2 billion - with an average of \$1.04 billion/yr.

Downsizing the U.S. nuclear weapons complex is not a priority.

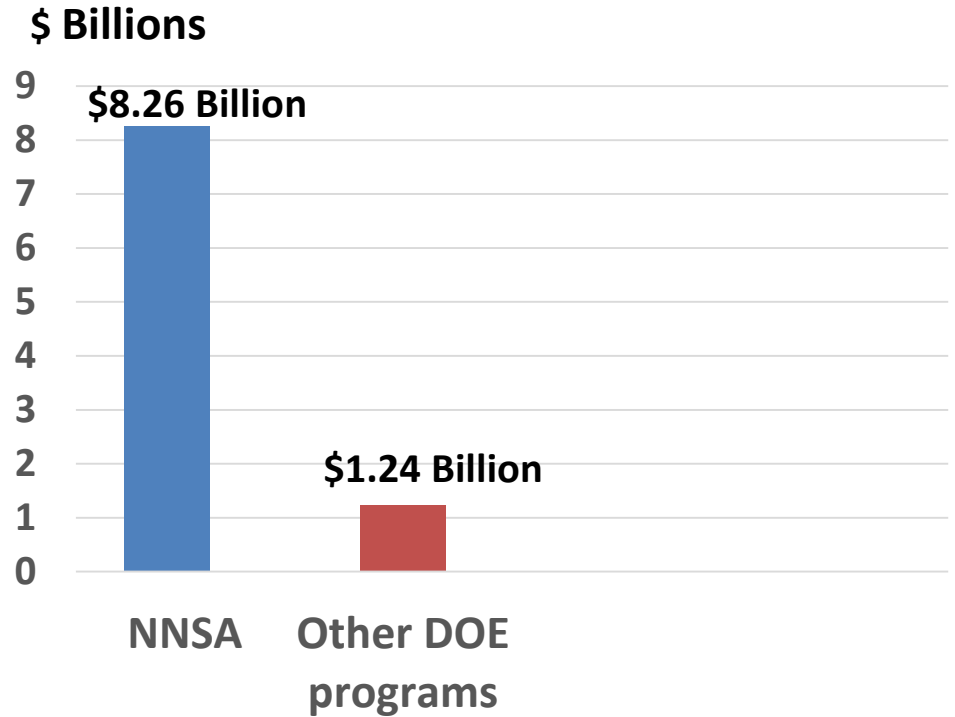


Excess Facilities Requiring Decontamination and Decommissioning



■ NNSA ■ Other DOE Programs

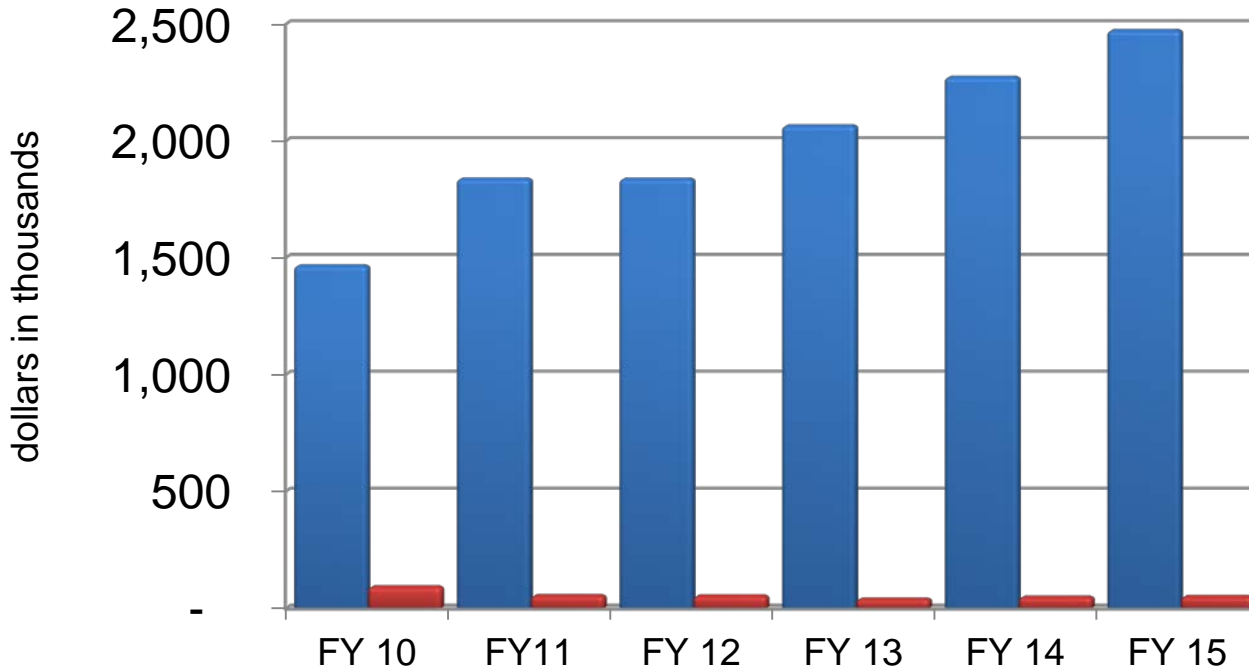
Estimated Unfunded D&D Liabilities as of 2011



Source: DOE: Facility Deactivation and Decommissioning 2011 Edition.

<http://energy.gov/sites/prod/files/em/DDMaps.11FINAL.pdf>

Elimination of Nuclear Weapons has a Low Priority



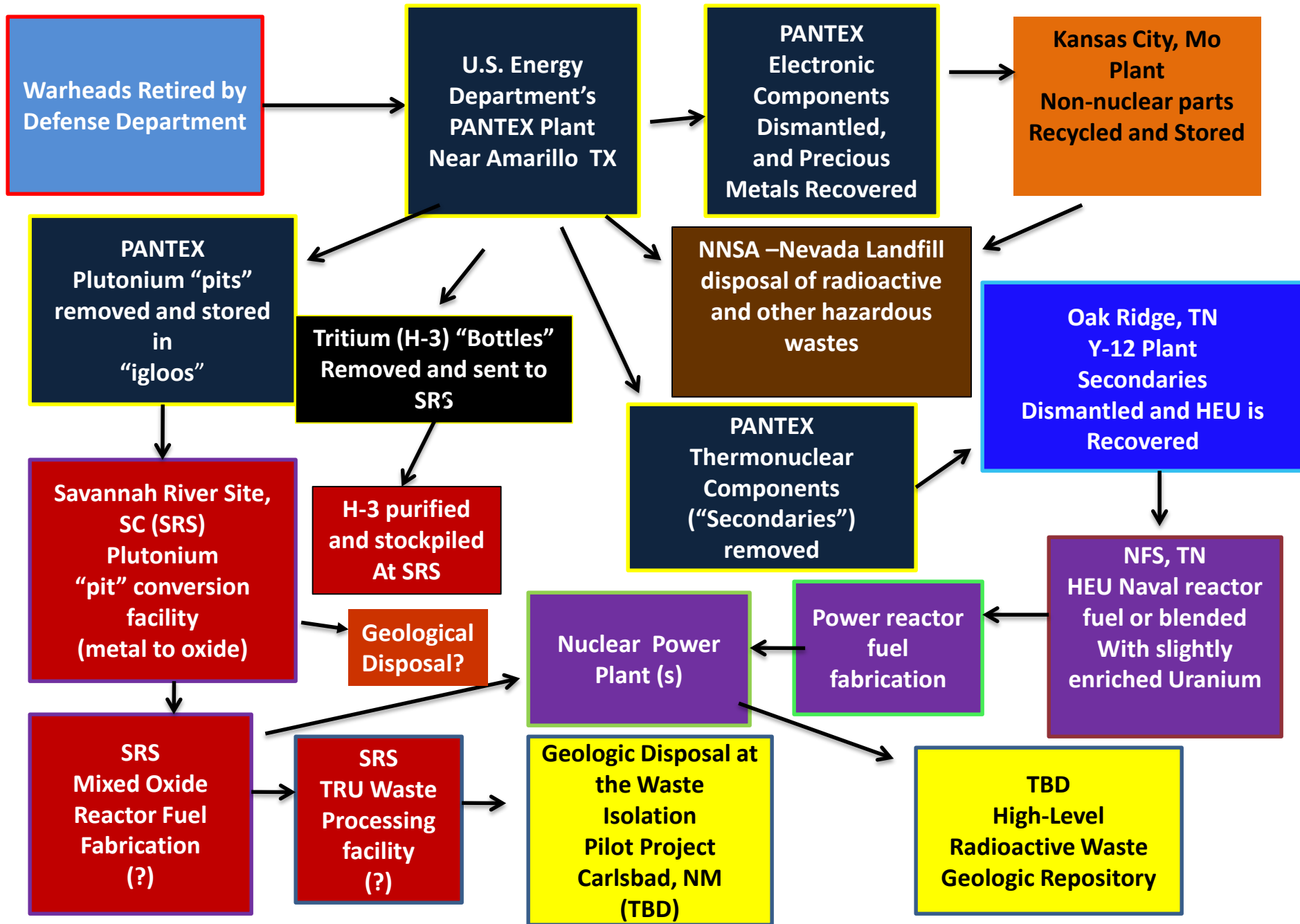
There is a 15-20 year backlog of some 2,300 retired nuclear warheads awaiting dismantlement.

Yet, funding for dismantlement will drop by nearly 50 percent over the next five years.

- Weapons stockpile service and life extension
- Dismantlement

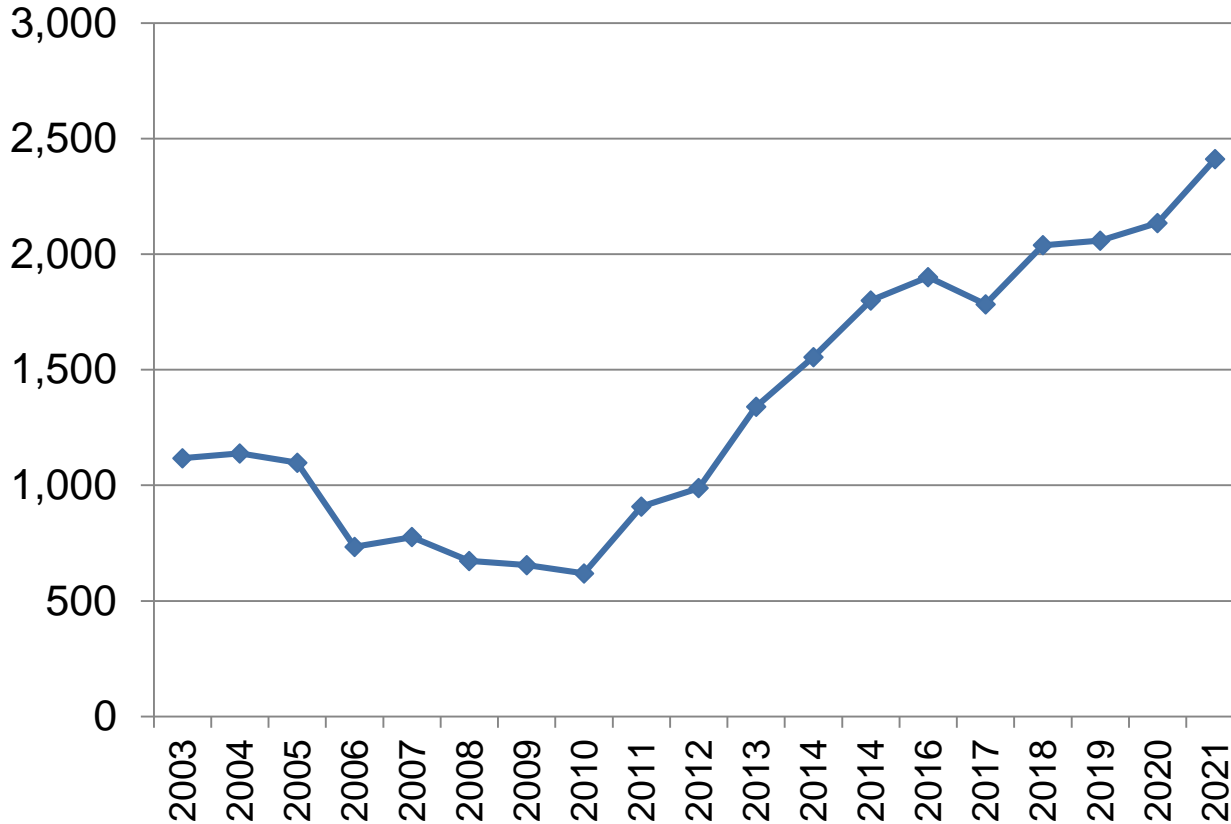
The Obama Administration plans to refrain from dismantling weapons cut under the New Start Treaty until a new production Infrastructure is restored sometime In the 2030s.

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



Costs for Nuclear Warhead Life Extension*

(thousands of dollars)



Between FY 2003 and 2021, about \$25.7 billion will be spent on nuclear warhead life extension.

During this period costs will have more than doubled.

*2015 adjusted dollars

Sources: DOE Congressional Budget Requests FY2003-2017

Lifetimes of Nuclear Warheads Could be Extended for Decades



Because of the 20-year voluntary moratorium on nuclear weapons testing by the United States, the design labs have claimed that long-term stockpile reliability cannot be guaranteed without new-design nuclear weapons.

This claim has been repudiated by the Jason group, a highly regarded group of special experts with a long history of credible advice to the U.S. nuclear weapons program. The Jason Group concluded:

- Lifetimes of today's nuclear warheads could be extended for decades, with no anticipated loss in confidence, by using approaches similar to those employed in life extension programs (LEPs) to date.
- This was no evidence that accumulation of changes incurred from aging and LEPs have increased risk to certification of today's deployed nuclear warheads.

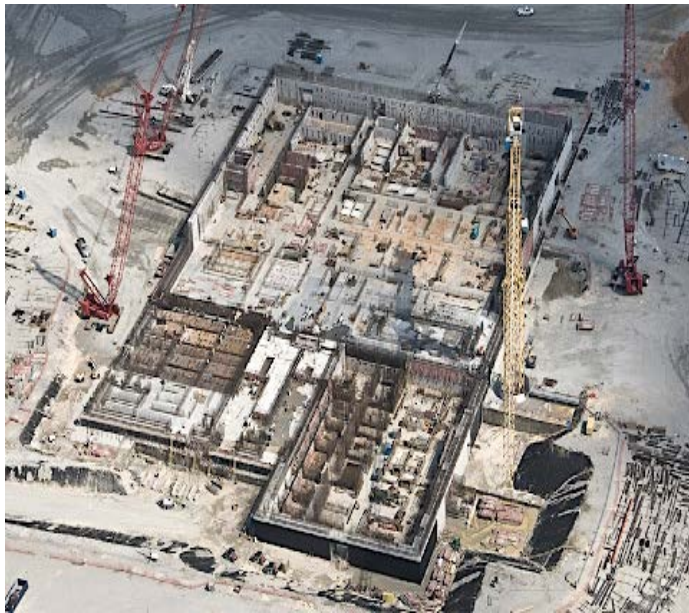
High Risk Projects

The U.S. Government Accountability Office (GAO) identified the DOE nuclear weapons program to be one of the government's top "high-risk" programs vulnerable to waste, fraud, and abuse. For instance:

- The Chemical and Metallurgy Research and Replacement (CMMR) facility at the Los Alamos National Laboratory in New Mexico. The main purpose of the CMMR is ramp up manufacturing capability of plutonium pits to as many as 80 per year by 2022. Its estimated costs increased from \$600 million in 2004 to \$5.8 billion in 2010.
- The Uranium Processing Facility (UPF) at the Y-12 weapons plant in Oak Ridge, TN. This facility is expected to replace an aged plant built in the 1950's. The estimated cost for this project has increased from \$600 million to \$19 billion.
- The NNSA's Life Extension Program costs for nuclear warhead types have increased by 400 percent.

The Mixed Oxide Program (MOX)

\$270 million (15%) of DOE's non-proliferation spending for FY 2017 is going to build facilities to mix plutonium from weapons with uranium for use in nuclear power plants (MOX) at DOE's Savannah River Site in South Carolina.



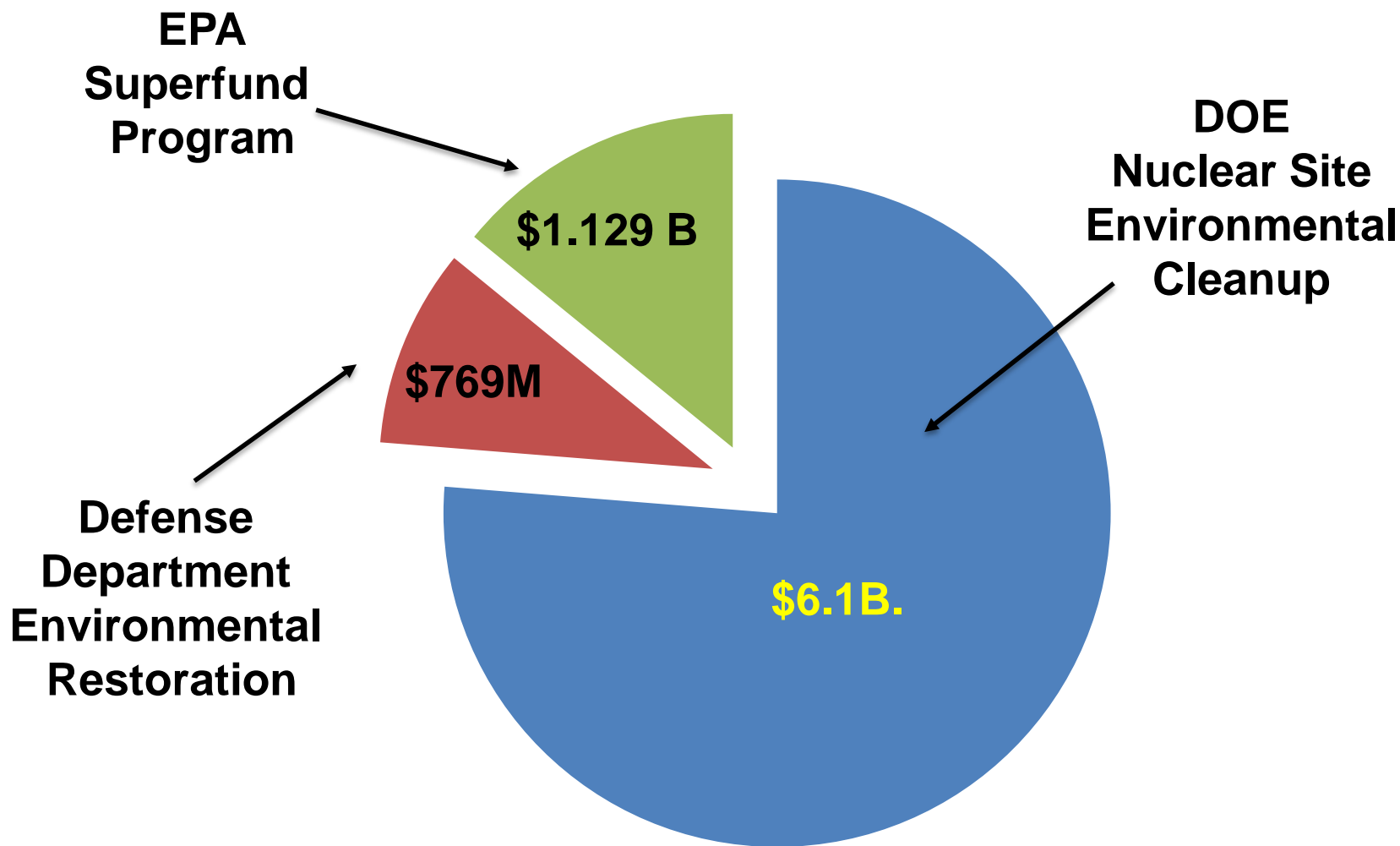
Source: MOX Project.com

The MOX project was originally the centerpiece of a 2000 agreement with Russia for each nation to mutually rid 34 metric tons of weapons plutonium.

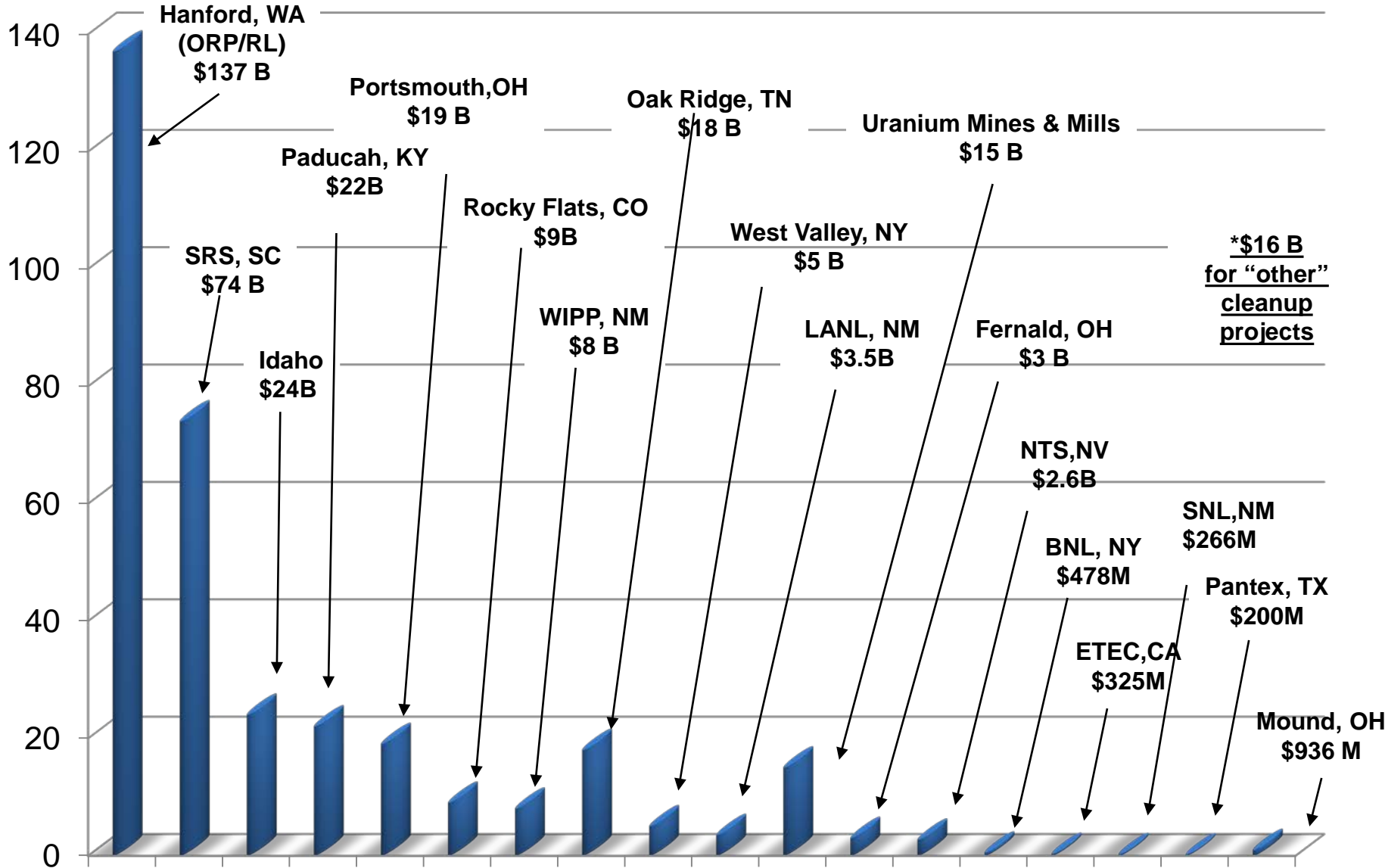
However, the agreement lost its original goal because Russia will not pay for its MOX program. Instead Russia is proceeding to use weapons plutonium to ultimately generate more plutonium in “fast” reactors.

This \$30 billion project is more than 10 years behind schedule and the original designated nuclear utility has balked at using MOX fuel.

**Nuclear weapons production resulted in the most complex and expensive environmental cleanup effort in the United States.
(FY 2017)**



DOE Site Cleanup Costs*



Sources: DOE 2008-2015, GAO 2005, EIA 2006

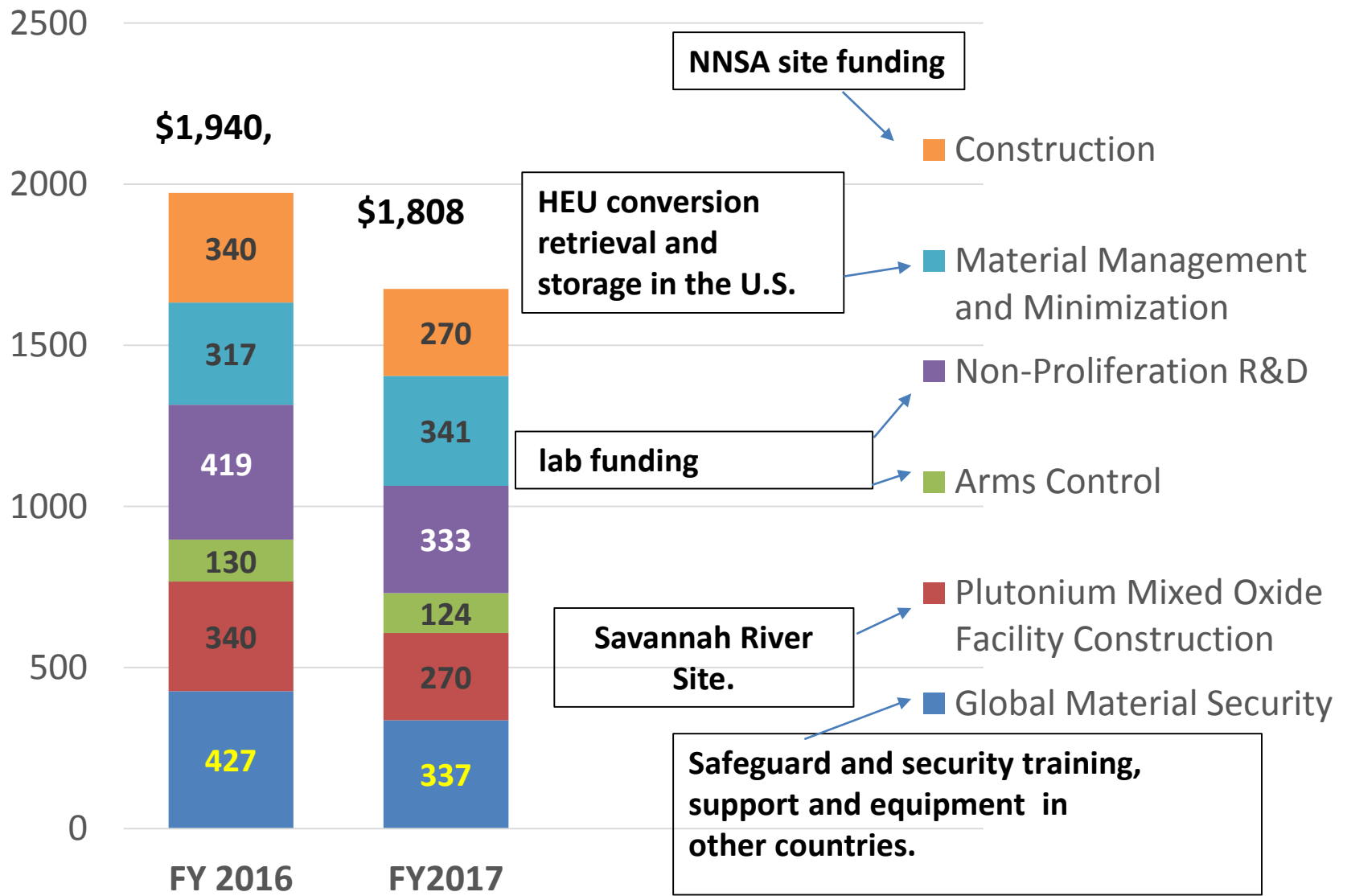
Total Cost = \$341.5 Billion

Does not include NNSA projects

2015 dollars

\$ Millions

Defense Nuclear Non-proliferation



Naval Reactors

Naval Reactors Funding by Congressional Control*

(Dollars in Thousands)

| | FY 2015 Enacted | FY 2015 Current | FY 2016 Enacted | FY 2017 Request | FY 2017 vs FY 2016 |
|--|--------------------|--------------------|--------------------|--------------------|-----------------------|
| Naval Reactors | | | | | |
| Naval Reactors Operations and Infrastructure | 390,000 | 390,000 | 445,196 | 449,682 | +4,486 |
| Naval Reactors Development | 411,180 | 411,180 | 446,896 | 437,338 | -9,558 |
| Ohio Replacement Reactor Systems Development | 156,100 | 156,100 | 186,800 | 213,700 | +26,900 |
| S8G Prototype Refueling | 126,400 | 126,400 | 133,000 | 124,000 | -9,000 |
| Program Direction | 41,500 | 41,500 | 42,504 | 47,100 | +4,596 |
| Construction | 113,320 | 113,320 | 121,100 | 148,300 | +27,200 |
| Subtotal, Naval Reactors | 1,238,500 | 1,238,500 | 1,375,496 | 1,420,120 | +44,624 |
| Rescission of Prior Year Balances | -4,660 | -4,660 | 0 | 0 | 0 |
| Total, Naval Reactors | 1,233,840 | 1,233,840 | 1,375,496 | 1,420,120 | +44,624 |

Outyears for Naval Reactors Funding

(Dollars in Thousands)

| | FY 2018 Request | FY 2019 Request | FY 2020 Request | FY 2021 Request |
|--|--------------------|--------------------|--------------------|--------------------|
| Naval Reactors | | | | |
| Naval Reactors Operations and Infrastructure | 468,551 | 530,093 | 551,917 | 599,173 |
| Naval Reactors Development | 462,912 | 505,300 | 521,800 | 594,275 |
| Ohio Replacement Reactor Systems Development | 156,700 | 138,000 | 75,500 | 64,700 |
| S8G Prototype Refueling | 190,000 | 250,000 | 215,000 | 50,000 |
| Program Direction | 48,200 | 49,300 | 50,500 | 51,700 |
| Construction | 141,388 | 305,694 | 363,600 | 311,100 |
| Subtotal, Naval Reactors | 1,467,751 | 1,778,387 | 1,778,317 | 1,670,948 |
| Use of Prior Year Balances | 0 | 0 | 0 | 0 |
| Rescission of Prior Year Balances | 0 | 0 | 0 | 0 |
| Total, Naval Reactors | 1,467,751 | 1,778,387 | 1,778,317 | 1,670,948 |

* The annual total includes an allocation to NNSA from the Department of Defense's five-year budget plan. The amount included for Naval Reactors is \$393,000,000 in FY 2018, \$402,000,000 in FY 2019, \$410,760,000 in FY 2020 and \$418,975,000 in FY 2021.

Summary



The DOE's is not structured to usher in the country's energy future.

For most of its existence, the majority of the DOE's annual spending has gone to maintaining the U.S. nuclear weapons complex and cleaning up its environmental legacy.

Now, a large funding increase is being sought as a down payment for nuclear weapons research and production modernization – estimated to cost about \$103.5 billion over the next 10 years.

Actual energy functions continue to take a back seat with only 22 percent of the budget.

Meanwhile, the quest to modernize the U.S. nuclear arsenal is proving to be more and more costly.