

NUCLEAR SECURITY SPENDING

ASSESSING COSTS, EXAMINING PRIORITIES

Stephen I. Schwartz
with **Deepti Choubey**



CARNEGIE ENDOWMENT

FOR INTERNATIONAL PEACE

WASHINGTON DC • MOSCOW • BEIJING • BEIRUT • BRUSSELS

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TABLE OF CONTENTS

Advisory Committee	4
Acknowledgments	5
Executive Summary	6
Introduction	15
Nuclear Forces and Operational Support	18
Deferred Environmental and Health Costs	24
Missile Defense	27
Nuclear Threat Reduction	30
Nuclear Incident Management	34
Recommendations	38
Notes	42
Appendix	47
About the Authors	75
Carnegie Endowment for International Peace	76

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ADDITIONAL RESOURCES

An electronic version of this report, a downloadable spreadsheet containing all the budgetary data assembled by the principal author, and additional resources are available at www.carnegieendowment.org/nuclearsecuritybudget.

EXECUTIVE SUMMARY

Although the United States does not maintain or track a nuclear weapons budget per se, it is possible, using publicly available government documents, to assemble a reasonably accurate—although not comprehensive—picture of most nuclear weapons and weapons-related spending.

To assess such expenditures, this study allocates them to one of five categories:

- **Nuclear forces and operational support**—costs associated with upgrading, operating, and maintaining nuclear delivery systems, warheads and bombs, and associated infrastructure;
- **Deferred environmental and health costs**—costs associated with managing and cleaning up radioactive and toxic waste resulting from and compensating victims of more than sixty years of nuclear weapons production and testing activities;
- **Missile defense**—costs associated with developing and deploying defenses against short- and long-range ballistic missiles;
- **Nuclear threat reduction**—costs associated with reducing and preventing nuclear threats at home and abroad by taking steps to secure nuclear weapons and weapons-related materials (primarily highly enriched uranium and plutonium), eliminate weapons and weapons-related materials, and stem the further proliferation of weapons, materials, and the technical knowledge to make them; and
- **Nuclear incident management**—costs associated with preparing for the use of nuclear or radiological weapons against the United States, including continuity of operations programs, efforts to detect and defuse terrorist weapons, technology to trace the source of radioactive materials used in such weapons, and medical and other response programs to deal with the aftermath of attacks.

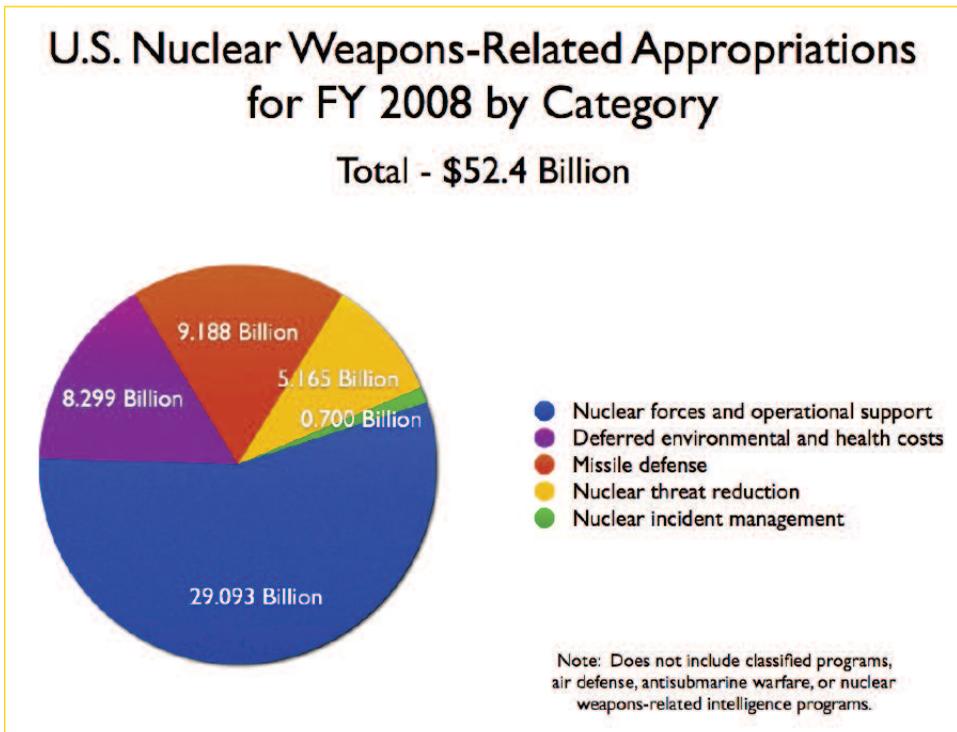
Findings

Total appropriations for nuclear weapons and weapons-related programs in fiscal year (FY) 2008 were *at least* \$52.4 billion, according to the best available data (see Figure 1). This does not include costs for air defense, antisubmarine warfare, classified programs, and most nuclear weapons-related intelligence programs. The total costs borne by the Department of Defense (DOD) to deploy and maintain nuclear forces are partially estimated and therefore may be too low.¹ Even so, this

amount is far larger than most officials would acknowledge. When these officials consider nuclear weapons costs, they generally do so only from the perspective of their respective department, agency, or jurisdiction.

By way of comparison, the 2008 nuclear weapons and weapons-related “budget” exceeds all anticipated government expenditures on international diplomacy and foreign assistance (\$39.5 billion) and natural resources and the environment (\$33 billion). It is nearly double the budget for general science, space, and technology (\$27.4 billion), and it is almost fourteen times what the U.S. Department of Energy (DOE) has allocated for all energy-related research and development. Moreover, the allocation of funds among the five categories reveals troubling realities about current government priorities in the nuclear arena.

FIGURE 1



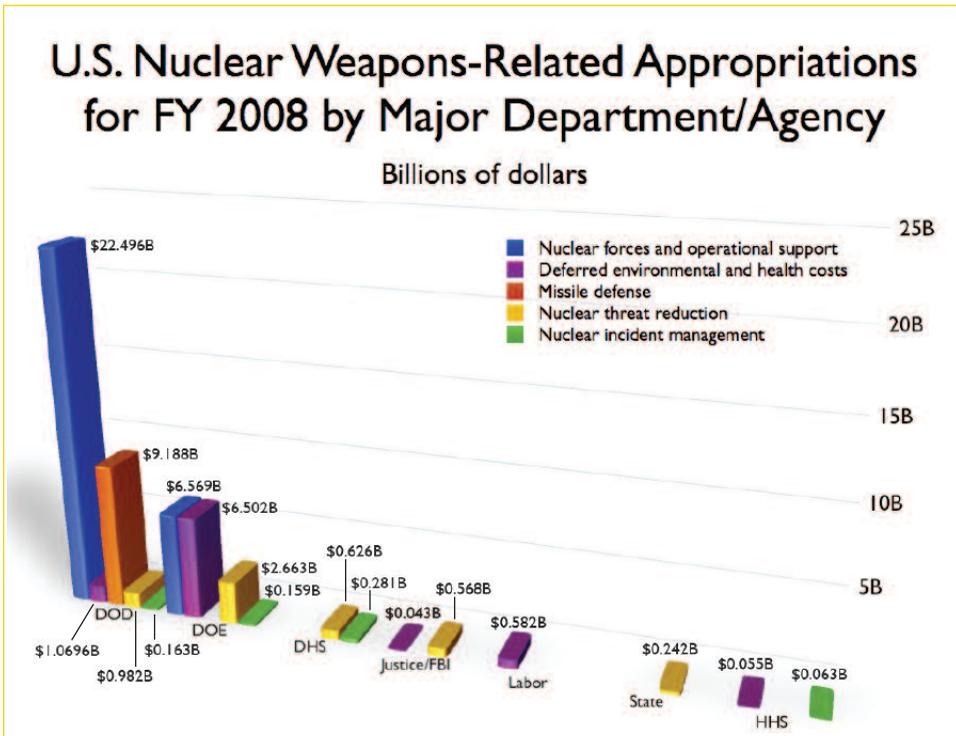
Nuclear weapons and weapons-related spending accounts for about:

- 67 percent of the DOE budget;
- 8.5 percent of the budget of the Federal Bureau of Investigation;
- 7.1 percent of the DOD budget (excluding the supplemental costs of the wars in Afghanistan and Iraq); and
- 1.7 percent of the Department of Homeland Security budget.²

Broken down by major agencies, the nuclear budget looks like this (see Figure 2 for a graphic representation of the disparities between agencies and categories):

- Department of Defense, \$33.9 billion;
- Department of Energy, \$15.9 billion;
- Department of Homeland Security, \$0.907 billion;
- Department of Justice, \$0.612 billion;
- Department of Labor, \$0.582 billion;
- Department of State, \$0.242 billion; and
- Department of Health and Human Services, \$0.119 billion.

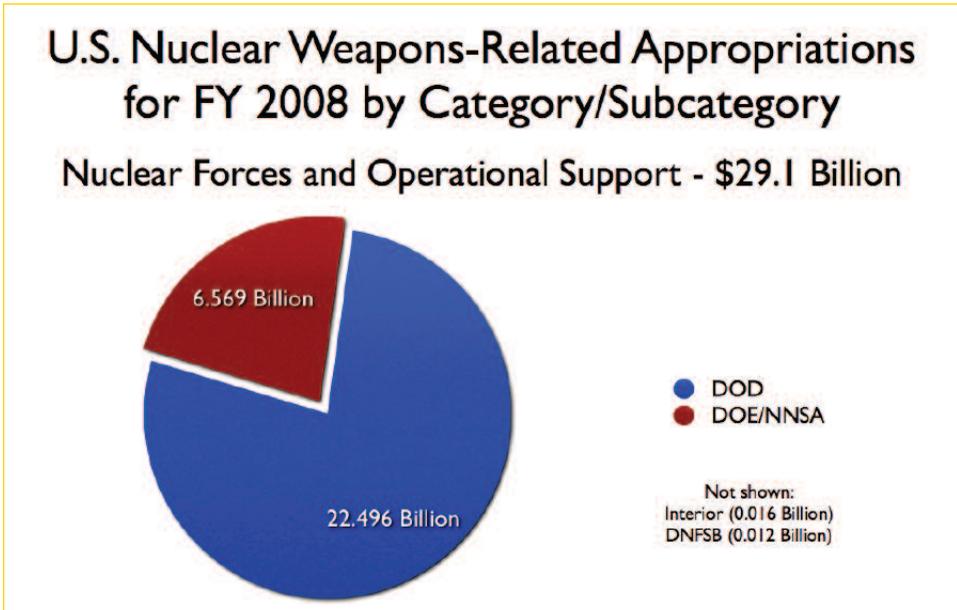
FIGURE 2



DOD = Department of Defense; DOE = Department of Energy; DHS = Department of Homeland Security; HHS = Department of Health and Human Services

About 55.5 percent (\$29.1 billion) of all nuclear expenses go toward upgrading, operating, and sustaining the U.S. nuclear arsenal (see Figure 3). These costs will increase significantly if the DOE's proposals to rebuild the nuclear weapons production complex and resume the production of nuclear weapons are approved and funded.

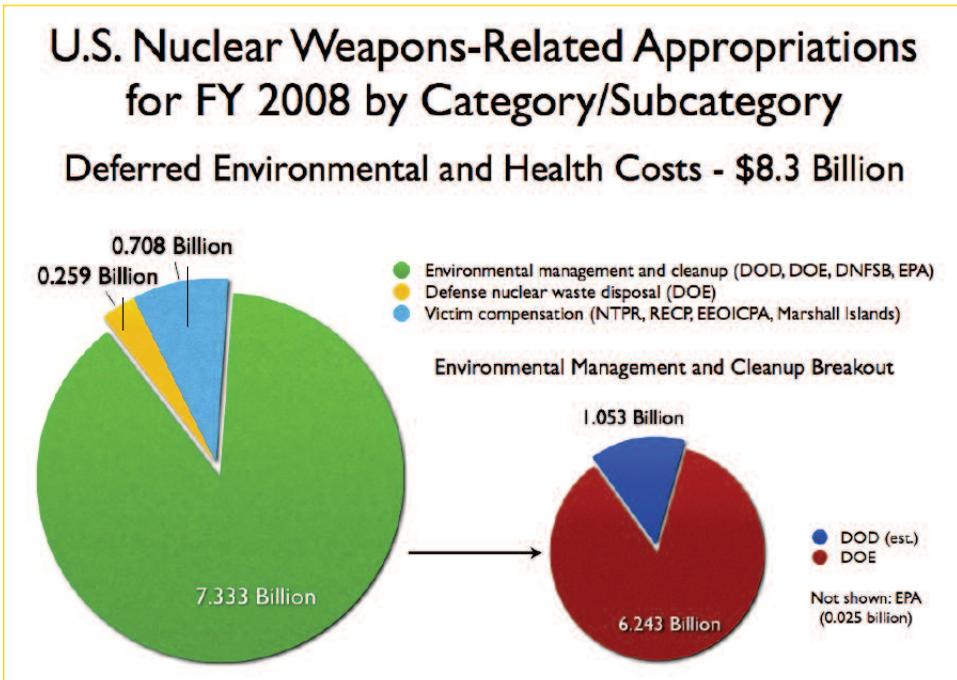
FIGURE 3



DNFSB = Defense Nuclear Facilities Safety Board

Another 15.8 percent (\$8.3 billion) was appropriated to address the deferred environmental and health costs of more than six decades of nuclear weapons production and testing (see Figure 4). Because these costs are largely (but not

FIGURE 4

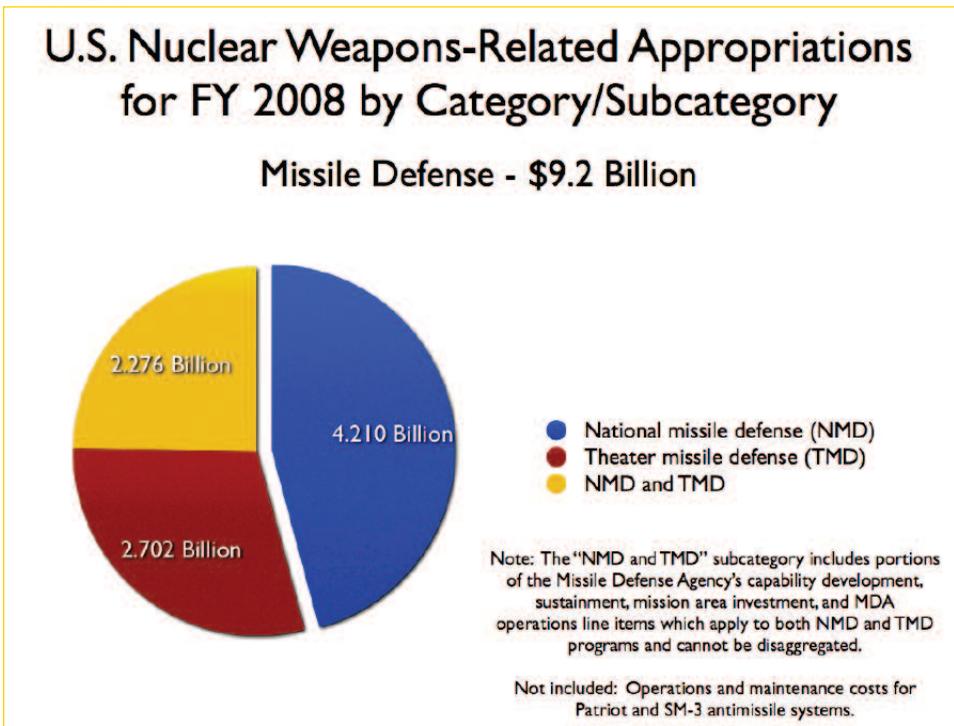


EPA = Environmental Protection Agency; NTPR = Nuclear Test Personnel Review; RECP = Radiation Exposure Compensation Program; EEOICPA = Energy Employees Occupational Illness Compensation Program Act

entirely) associated with historical activities, they are loosely connected to the costs of sustaining the current arsenal. However, if nuclear weapons production resumes, or if the DOE moves forward with plans to decommission many older production sites, these costs will increase in the future.

Some 17.5 percent (\$9.2 billion) was appropriated for missile defense programs, 56 percent more than the amount allocated for all nuclear threat reduction programs (see Figure 5). Deploying components of a land-based antimissile system in Poland and the Czech Republic, as proposed by the George W. Bush administration, would push these costs higher in future years.

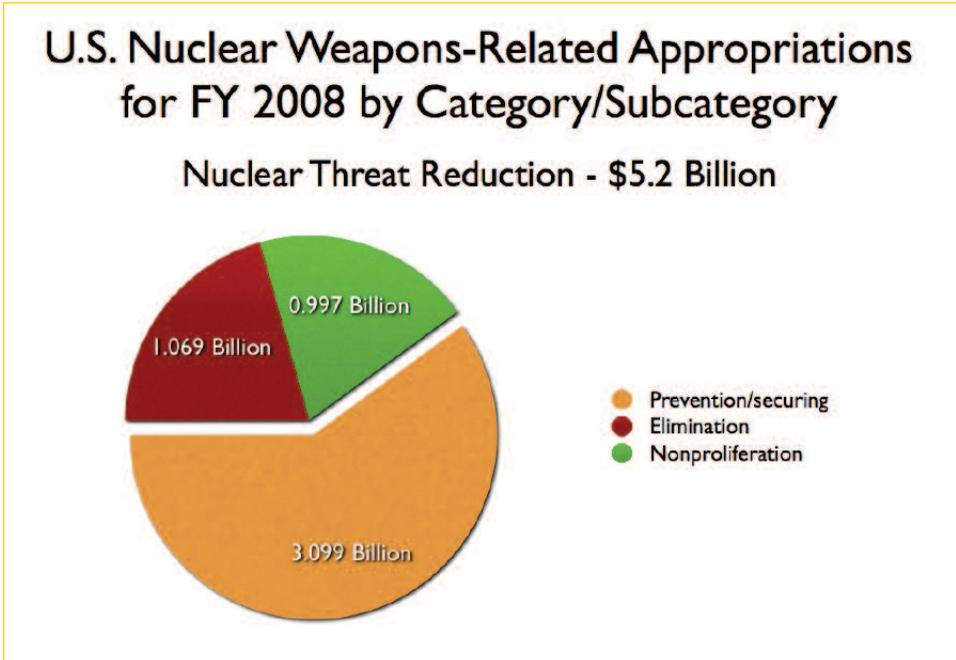
FIGURE 5



Efforts to stem the spread of nuclear weapons and nuclear technology, eliminate "loose nukes," and prevent the use of nuclear weapons anywhere are a relatively low budgetary priority. Just 9.9 percent (\$5.2 billion) was appropriated for such activities in 2008. Of that total, \$3.1 billion (60 percent) went toward preventive and security measures, \$1.1 billion (20.7 percent) focused on eliminating nuclear threats, and \$997.3 million (19.3 percent) was for nonproliferation programs (see Figure 6). In comparison, the DOE's National Nuclear Security Administration received nearly \$5 billion for "defense programs" to sustain the nuclear stockpile. The DOD allocated an estimated additional \$22.5 billion to upgrade, operate, and maintain the U.S. strategic nuclear arsenal. Although threat reduction programs do

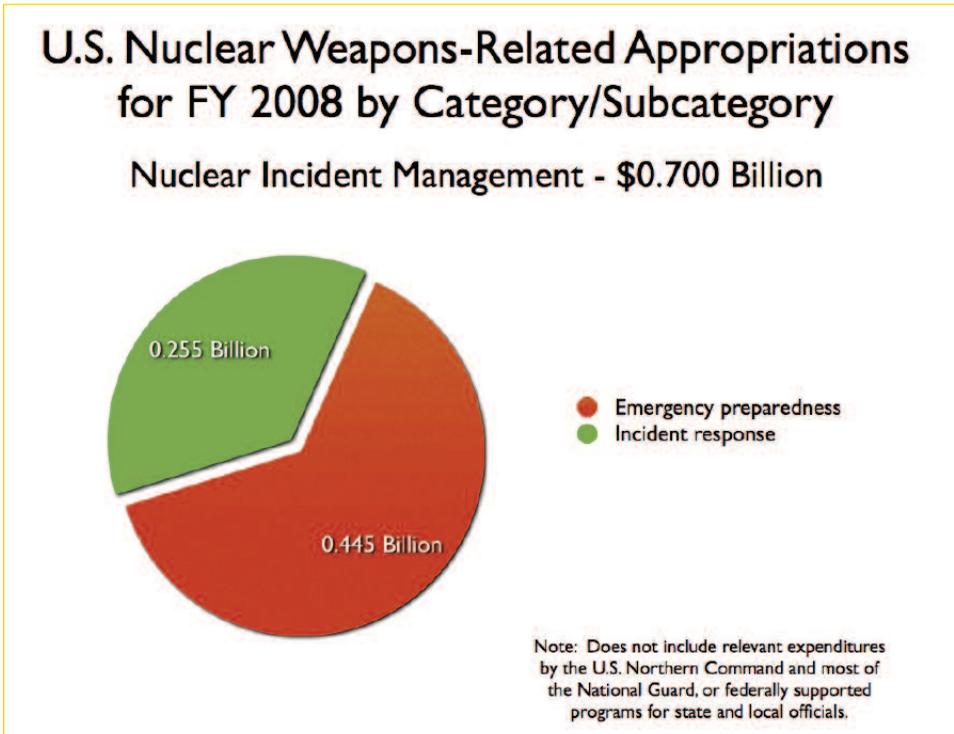
not require and would not always benefit from the same level of investment as operational forces (not least because they are generally less capital-intensive and have more limited objectives), this disparity sends a message to the rest of the world that the United States considers preserving and enhancing its nuclear options more important than preventing nuclear proliferation.³

FIGURE 6



Considering the concerns raised by government officials and others in recent years about the increasing likelihood that terrorists will use nuclear or radiological weapons on U.S. soil, it is noteworthy that in 2008 slightly less than \$700 million (1.3 percent) was appropriated to prepare for the consequences of the use of these weapons, including continuity of government programs, training expert teams to detect and defuse weapons, and developing methods to trace the original source of materials used in such weapons (see Figure 7). It is important to note, however, that some relevant preparedness spending, particularly by the DOD and the HHS, is not captured in this total because it is for disaster response generally and not nuclear attacks specifically. In addition, this study captures only federal spending, not state and local funding for emergency preparedness and response (little if any of which would be tied directly to nuclear terrorism but which nonetheless could be used to address it). Moreover, civil defense measures historically received relatively little funding, because officials did not want to undermine public confidence in nuclear deterrence, because of the difficulties in providing protection to the entire population, and because military leaders strongly and consistently favored offensive over defensive measures as the best allocation of government resources.

FIGURE 7



These findings are explored in more detail in the sections below.

Recommendations

Effective oversight of government nuclear security programs is impossible without complete, reliable data on their comprehensive annual and cumulative costs. Such an accounting has never been available to decision makers. Below are four key recommendations for policy makers to consider that would help rectify this fundamental problem and improve U.S. nuclear policy.

CREATE COMPREHENSIVE NUCLEAR ACCOUNTING SYSTEMS

Congress should require the executive branch to prepare and submit annually, in conjunction with the annual budget request, an unclassified and classified accounting of all nuclear weapons–related spending for the previous fiscal year, the current fiscal year, and the next fiscal year. The DOD, using the Future Years Defense Program, should project its nuclear weapons–related spending five or six years into the future.

A senior White House official, perhaps within the congressionally mandated office to coordinate nuclear proliferation and counterterrorism efforts, or the National Security Council, should be responsible for overseeing this annual exercise, in conjunction with key officials of the Office of Management and Budget and senior budget officials of key departments and agencies.

QUANTIFY NUCLEAR-RELATED INTELLIGENCE EXPENDITURES

The congressional armed services, defense appropriations, and intelligence committees, working with the intelligence community, should devise tools to better explain and quantify nuclear weapons–related intelligence expenditures. They should ascertain, to the greatest extent possible, how much is spent to enhance the effectiveness of operational nuclear forces, how much is spent supporting defensive operations related to nuclear weapons (missile defense, air defense, and antisubmarine warfare), and how much is spent supporting efforts to prevent and eliminate nuclear threats, and prepare and respond to nuclear incidents. Greater insight and transparency about these matters (at the very least within policy-making circles) could enhance understanding of U.S. intelligence capabilities and lead to a better allocation of intelligence assets to address urgent nuclear-related threats.

FOCUS ON PROACTIVE THREAT REDUCTION STRATEGIES

Greater fiscal and programmatic emphasis should be placed on programs that seek to secure and prevent the proliferation of nuclear weapons, weapons materials, and technical knowledge, and to eliminate threats posed by such weapons, materials, and knowledge. Such efforts—notably the DOD’s Cooperative Threat Reduction (CTR) and the DOE’s Materials Protection, Control, and Accounting (MPC&A) program—have a demonstrated record of success, are proactive, are more cost-effective than technology-driven efforts such as missile defenses, and can be implemented quickly and at a relatively modest cost to ensure significant security gains today and in the future. These efforts currently receive funding sufficient for their limited scope, but increased funding, as recommended above, will be required to implement President-elect Obama’s pledge to “lead a global effort to secure all nuclear weapons and material at vulnerable sites within four years.”⁴

In addition, if the Obama administration chooses to continue the Proliferation Security Initiative, it should establish clear metrics to track its accomplishments and submit a detailed accounting of the previous year’s expenses for the program with future budget requests. At present, the costs associated with PSI exercises and

operations come from the annual operating funds for the vessels and aircraft that participate (the specific costs to oversee the effort at the DOD and the State Department, and other federal agencies, are unknown but are probably captured, at least in part, under the nuclear threat reduction category in this report). Given the nature and purpose of the PSI, it may not be feasible to anticipate all costs in advance, but knowing how much has been spent to achieve the program's benefits is essential for accountability and success.

ENSURE EQUITY FOR ATOMIC VETERANS

Finally, very little is known about the costs of treating veterans who were exposed to dangerous levels of radiation while participating in atmospheric nuclear testing activities between the middle 1940s and the early 1960s—unlike programs created to compensate civilians injured by fallout from atmospheric nuclear weapons tests or workers at the DOE's nuclear weapons production facilities who were exposed to dangerous levels of radiation or toxic chemicals. Congress should require the Department of Veterans Affairs to provide a complete accounting of the number of veterans, past and present, who have requested and received compensation and care for injuries and illnesses attributable to exposure to radiation from U.S. nuclear weapons tests, including the cost of such compensation and care. Aggregated cumulative and annual figures for those whose claims have been denied should also be published, to enable comparisons with the Radiation Exposure Compensation Program and the Energy Employees Occupational Illness Compensation Program Act.

Implementing these recommendations will increase understanding and accountability, which in turn will lead to greater public support for critical nuclear security programs and a more effective allocation of public resources. When combined with a new focus on nuclear policy matters, including the administration's forthcoming Nuclear Posture Review, such efforts will help to ensure that U.S. political and fiscal nuclear priorities are properly aligned.

INTRODUCTION

More than seventeen years after the end of the Cold War, it may come as a surprise to most Americans that the United States still allocates relatively large annual sums to upgrade and maintain its nuclear arsenal, develop and field active defenses against ballistic missiles, and address the long-deferred environmental and health costs associated with more than fifty years of unconstrained bomb building and weapons testing.⁵ And it may be even more surprising that seven years after the September 11, 2001, terrorist attacks—and at a time when government officials and outside experts are expressing a growing concern over the prospect of a nuclear 9/11—the government is spending relatively little money locking down and eliminating nuclear threats at the source before they can reach U.S. shores, or preparing for the consequences of a nuclear or radiological attack on U.S. soil.⁶

Money, of course, is not the only or sometimes even the best measure of governmental priorities. In the case of nuclear weapons, it is important to realize that building and operating nuclear weapons systems, and the entire infrastructure supporting them, is very capital- and labor-intensive and therefore more costly than, for example, efforts to conduct inventories of highly enriched uranium and plutonium in other countries and erect security barriers to protect that material from theft. Although nuclear threat prevention programs do not necessarily require significant budget increases to be effective, even modest increases can substantially reduce nuclear threats over the long term. In a time of rising economic and fiscal concerns and increasing proliferation-related dangers, U.S. taxpayers should demand and U.S. government leaders should ensure that the country is getting the most out of its nuclear security dollars.

This study—building on a more comprehensive historical assessment of the costs of the U.S. nuclear weapons program published in 1998,⁷ as well as the ongoing analytical efforts of more than a dozen nongovernmental nuclear policy and budget experts—seeks to provide tentative answers to several critical questions: What does the United States spend to maintain its nuclear arsenal; manage and clean up the wastes left over from decades of weapons production; defend against nuclear attack; prevent the further spread of nuclear weapons, weapons materials, technology, and expertise; and prepare for the consequences of a nuclear or radiological attack? Or, in other words, how much does the United States spend on nuclear security?⁸

To better explain the various costs underlying the answers to these critical questions, this study has devised an analytic framework that includes five categories for allocating existing program expenses:

- **Nuclear forces and operational support**—the costs associated with upgrading, operating, and maintaining nuclear delivery systems, warheads and bombs, and associated infrastructure;
- **Deferred environmental and health costs**—the costs associated with managing and cleaning up radioactive and toxic waste resulting from and compensating victims of more than sixty years of nuclear weapons production and testing activities;
- **Missile defense**—the costs associated with developing and deploying defenses against short- and long-range ballistic missiles;
- **Nuclear threat reduction**—the costs associated with reducing and preventing nuclear threats at home and abroad by taking steps to secure nuclear weapons and weapons-related materials (primarily highly enriched uranium and plutonium), eliminate weapons and weapons-related materials, and stem the further proliferation of weapons, materials, and the technical knowledge to make them; and
- **Nuclear incident management**—the costs associated with preparing for the use of nuclear or radiological weapons against the United States, including continuity of operations programs, efforts to detect and defuse terrorist weapons, technology to trace the source of radioactive materials used in such weapons, and medical and other response programs to deal with the aftermath of attacks.

This report can only provide tentative answers, not *the* answers, to the critical questions raised above, for three primary reasons. First, because some programs related to nuclear weapons, and nearly all programs pertaining to intelligence-related matters, are classified, their specific budgets are unavailable to those without a “need to know.” Second, a number of programs relating to the operation of U.S. nuclear forces also support conventional missions (for example, dual-capable bomber aircraft and ground-based and satellite communication networks), and there is no easy way to disaggregate nuclear from non-nuclear costs, particularly because the DOD does not do so when preparing budgets or tracking expenses. This same problem applies to certain programs aimed at preparing for and addressing the consequences of a nuclear or radiological attack, because “disaster preparedness” can and does support a variety of incident scenarios. Third, the missions of some programs, notably air defense and antisubmarine warfare, encompass a variety of efforts, not all of which are directly

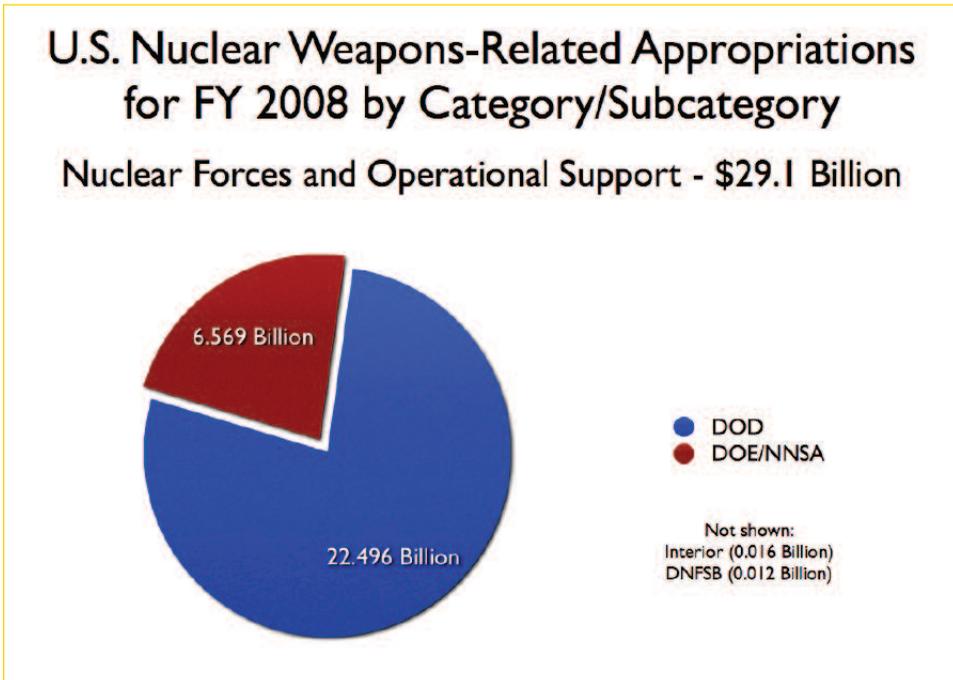
related to defending against a nuclear attack. Determining how much the DOD spends in these areas is impossible without access to information about specific DOD mission plans and line-item budgets, which are inaccessible to the public. Moreover, even the DOD would likely find it difficult to attribute an appropriate share of total air defense and antisubmarine warfare spending to the nuclear side of the budget, because many expenses in these areas would be incurred whether or not a nuclear mission was involved. Accordingly, they are excluded from consideration in this analysis. This means that the category totals and overall totals presented in this report are most accurately viewed as the minimum annual expenditures for nuclear weapons and weapons-related programs—as a floor rather than a ceiling.

The financial data in this report are generally budget authority as appropriated by Congress for FY 2008.⁹ Though appropriations for the DOD must be spent during the fiscal year for which they were authorized or the funding reverts back to the Treasury, those for the DOE and some other agencies do not expire and can be multiyear. This means that appropriations for a given fiscal year, and especially for the DOE, are not necessarily equivalent to actual spending or outlays for that year.

Note: The tables below are color-coded for easy reference. Blue denotes programs associated with nuclear forces and operational support. Lavender denotes programs associated with deferred environmental and health costs. Orange denotes programs associated with missile defense. Yellow denotes programs associated with nuclear threat reduction. And green denotes programs associated with nuclear incident management. These are the same colors used to depict these categories in figures one and two.

NUCLEAR FORCES AND OPERATIONAL SUPPORT

FIGURE 8



Nuclear forces and operational support refers to all costs associated with upgrading, operating, and maintaining the U.S. nuclear arsenal. This includes nuclear bombers, ballistic missiles, and ballistic missile submarines; command, control, and communications networks; and the DOE's nuclear weapons production complex.

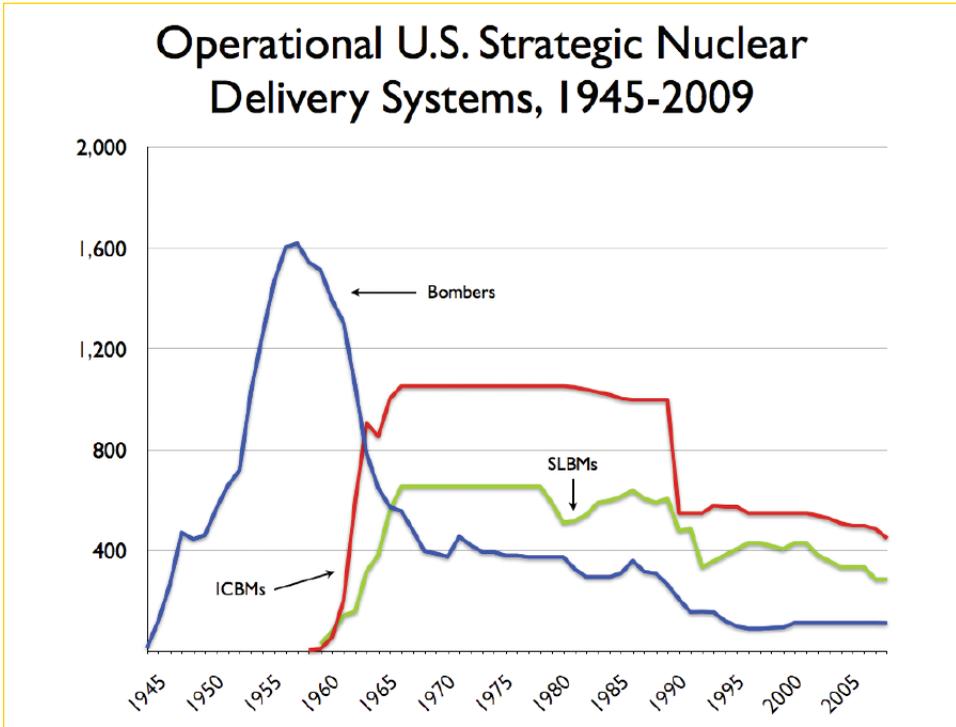
For FY 2008, an estimated \$29.1 billion was budgeted to operate and sustain the U.S. nuclear arsenal and the nuclear weapons production complex. This is 55.5 percent of the overall nuclear weapons and weapons-related budget and is shared among four departments and agencies (see Table 1).

TABLE 1. *Federal Appropriations for Nuclear Forces and Operational Support, FY 2008 (billions of dollars; does not add due to rounding)*

Total	29.093
Department of Defense (DOD)	22.496
Department of Energy/National Nuclear Security Administration (NNSA)	6.569
Defense Nuclear Facilities Safety Board (DNFSB)	0.012
Department of the Interior (Kwajalein Atoll lease)	0.016

The DOD is responsible for operating and maintaining the nuclear triad of B-52H and B-2A bombers, Minuteman III ballistic missiles, and Ohio-class ballistic missile submarines armed with Trident II D5 missiles (see Figure 9). It is also responsible for developing, testing, and procuring upgrades and replacements for these weapons systems.

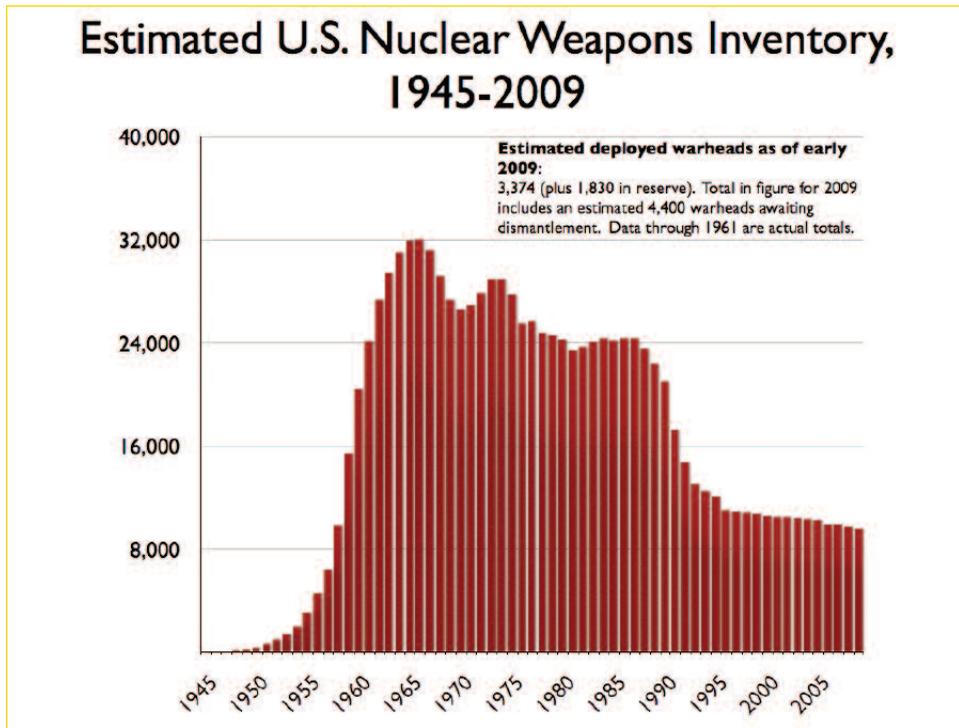
FIGURE 9



Robert S. Norris and Thomas B. Cochran, "U.S.-U.S.S.R./Russian Strategic Offensive Forces, 1946-96," Nuclear Weapons Databook Working Paper 97-1 (Washington, DC: Natural Resources Defense Council, January 1997); Robert S. Norris, William M. Arkin, and Hans M. Kristensen, "U.S. Nuclear Forces," *Bulletin of the Atomic Scientists*, 1998-2009.

The DOE/NNSA (like its predecessor, the Atomic Energy Commission) is responsible for researching, developing, testing, and producing nuclear warheads, and for servicing operational weapons, presently estimated to number more than 4,000 (see Figure 10). It also dismantles these weapons once they are retired from the active stockpile and stores (for now) surplus highly enriched uranium and plutonium at, respectively, the Y-12 Plant in Oak Ridge, Tennessee, and the Pantex Plant in Amarillo, Texas.

FIGURE 10



Robert S. Norris and Thomas B. Cochran, "U.S.-U.S.S.R./Russian Strategic Offensive Forces, 1946-96," Nuclear Weapons Databook Working Paper 97-1 (Washington, DC: Natural Resources Defense Council, January 1997); Robert S. Norris, William M. Arkin, and Hans M. Kristensen, "U.S. Nuclear Forces," *Bulletin of the Atomic Scientists*, 1998-2009.

The DNFSB, established by Congress in 1988, provides independent oversight of the DOE's nuclear weapons production complex. Because much of its work today involves overseeing work on environmental restoration and waste management projects, it is useful to split its annual budget equally between this category and "deferred environmental and health costs."¹⁰ The Department of the Interior administers the lease for Kwajalein Atoll, which houses a vital installation (formerly the Kwajalein Missile Range and now known as the Ronald Reagan Ballistic Missile Defense Test Site) managed by the U.S. Army for supporting tests of ballistic missiles and missile defense interceptors, monitoring foreign missile tests and space launches, tracking and imaging objects in orbit, and conducting deep space surveillance.

The DOD does not track nuclear weapons spending per se. But beginning in 1962 under the leadership of Secretary of Defense Robert S. McNamara, it implemented a new department-wide accounting system and began tracking the costs of strategic nuclear weapons programs under the category Major Force Program 1 (MFP 1). MFP 1 is a useful but imperfect tool. Today, for example, it includes all the

costs associated with the strategic bomber force, because these aircraft were originally conceived, built, and deployed to carry nuclear weapons. Although that nuclear mission remains, and crews continue to train to carry it out, the remaining strategic bombers (twenty B-2As and ninety-four B-52s) spend more time training and flying conventional missions.¹¹ Thus the total above may overstate the actual costs associated with operating and maintaining the strategic nuclear arsenal.

However, the total includes no intelligence-related spending, even though intelligence continues to play an essential role in ensuring the effectiveness of the nuclear arsenal. Whereas the intelligence community expended significant sums during the Cold War to find out what the Soviet Union was doing militarily and to develop target packages for U.S. nuclear weapons, that mission, while still important, is no longer the central organizing focus of the intelligence community.¹²

In 1997 and 1998, the Central Intelligence Agency (CIA) yielded to a lawsuit aimed at forcing the government to disclose the total size of the National Intelligence Program (NIP) budget (as distinct from the tactical intelligence typically gathered by the military services and associated agencies). The CIA reported that the NIP budget was \$26.6 billion in 1997 and \$26.7 billion in 1998. Then, in 2007, a new law required the intelligence community, now reorganized following 9/11, to begin reporting the total size of the NIP budget each year. As of FY 2007, that budget had increased to \$43.5 billion. In October 2008, the director of national intelligence announced that the budget for the NIP in FY 2008 had risen again, to \$47.5 billion. No other details have been released, although a newspaper report at about the same time as the most recent disclosure revealed that the CIA's Directorate of Science and Technology has increased the number of personnel it deploys overseas by 150 percent since 9/11.¹³

Inflation probably accounts for nearly half of the more than \$20 billion increase in the NIP budget between 1998 and 2008. Much of the remainder probably was a consequence of the response to 9/11 and of the significant intelligence-related duties associated with the wars in Afghanistan and Iraq. But nuclear-related intelligence work clearly continues. For example, Seymour Hersh reported in July 2008 that "late last year, Congress agreed to a request from President Bush to fund a major escalation of covert operations against Iran.... These operations, for which the President sought up to four hundred million dollars, were described in a Presidential Finding signed by Bush, and are designed to destabilize the country's religious leadership.... They also include gathering intelligence about Iran's suspected nuclear-weapons program."¹⁴ There is no doubt that analysts continue to study North Korea and Syria, and to monitor strategic developments in Russia and China.

This report includes no estimate of nuclear-related intelligence spending for two reasons. First, it is impossible to derive an accurate unclassified number for such activities. And second, there is no way of segregating intelligence collection and analysis by function so that the resulting number would be meaningful in the context of the present study (a task complicated by the fact that many intelligence platforms can perform multiple functions, sometimes simultaneously).¹⁵ However, it appears reasonable to conclude, based on previous analyses, that *at least* 10 percent of the NIP budget—or approximately \$5 billion—might be allocated to missions pertaining to some aspect of nuclear weapons, whether gathering and analyzing information to develop and refine targets for nuclear weapons, supporting efforts to develop an effective defense against ballistic missiles, or preventing the further proliferation of nuclear weapons and weapons-related materials and illicit trafficking in nuclear technology.

MFP 1 does not include all the costs associated with strategic nuclear weapons (nor does it include the shrinking costs associated with deploying an estimated 150 to 240 nuclear weapons in five NATO European countries—Belgium, Germany, Italy, the Netherlands, and Turkey).¹⁶ Therefore, it is necessary to estimate the share of spending that might be devoted to nuclear forces within six other MFPs (MFP 3—Command, Control, Communications, Intelligence, and Space; MFP 6—Research and Development; MFP 7—Central Supply and Management; MFP 8—Training, Medical, and Other; MFP 9—Administrative and Associated Programs; and MFP 10—Support of Other Nations). This is accomplished by adding together the FY 2008 totals for MFPs 1, 2, and 11 (Strategic Forces, General Purpose Forces, and Special Operations Forces), dividing MFP 1 by this figure, and multiplying the remaining MFPs by the resulting amount, which indicates that MFP 1’s operating and support costs might be about \$10.9 billion.¹⁷

Since 2002 or even earlier, the DOD has been actively pursuing concepts for developing the capability to deliver a prompt conventional-weapons global strike that could, among other things, be used to destroy an adversary’s nuclear weapons or nuclear weapons facilities in less than an hour without resorting to the use of nuclear weapons. Though there may be potential security benefits to fielding highly accurate conventionally-armed ballistic missiles, Congress has been skeptical and has expressed concern that the DOD’s preferred option—modifying a limited number of Trident II D5 submarine-launched ballistic missiles to carry conventional warheads—could inadvertently decrease crisis stability and possibly lead to the inadvertent use of nuclear weapons. Congress rejected most of the administration’s \$127 million request for this program for FY 2007, and for FY 2008 it redirected the administration’s \$100 million request to test, manufacture, and deploy conventional Tridents toward “a new Prompt Global Strike program element within the Research, Development, Test and Evaluation, Defense-Wide appropriation only

for development of promising conventional prompt global strike technologies.”¹⁸ Because this program is not solely intended for use against nuclear weapons or other nuclear threats, and because it remains in an early stage, its costs are not included here. However, if this effort continues under the Obama administration, some portion should be included in future nuclear security budgets.

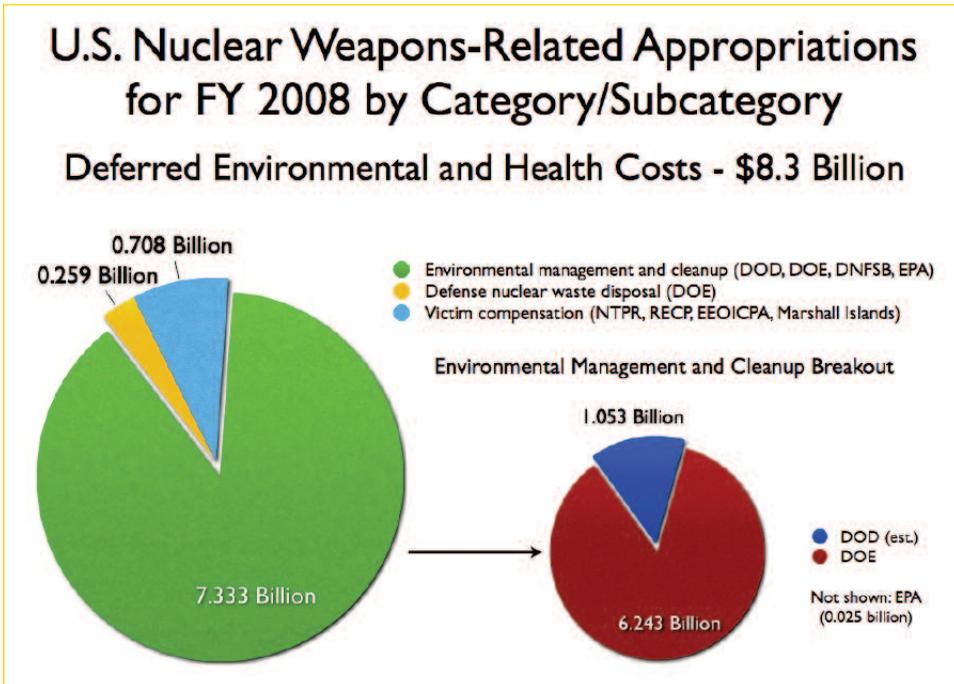
MFP 1 also includes some modest costs for the Navy’s nuclear reactor program, a joint DOD-DOE program. Only 14 of the 101 currently operating naval nuclear reactors are for ballistic missile submarines, and there are also 2 land-based training reactors used to qualify new engineers (equaling about 16 percent of all operational naval reactors), but neither the Navy nor the DOE breaks down costs by type of vessel.¹⁹ So this study includes just 16 percent of the overall total of naval reactor and reactor-associated costs.

With regard to the NNSA budget, it must be pointed out that a small portion of the operating costs of the Pantex and Y-12 plants and their associated site offices (\$1.4 billion),²⁰ as well as the “Secure Transportation Asset” (the specially armored tractor-trailers that transport nuclear weapons to and from Air Force and Navy bases across the country), are associated with dismantling nuclear weapons and would fall under the “elimination” subcategory in “nuclear threat reduction.” Although the NNSA does not publicly disaggregate these costs by facility, it does provide a budget line item for dismantlement that is discussed below.²¹

If the preferred alternative in the NNSA’s October 2008 Supplemental Programmatic Environmental Impact Statement on “complex transformation” is chosen by the Obama administration and approved by Congress, there would be substantial new costs to implement the agency’s plan to consolidate and rebuild parts of the existing production complex, and to manufacture a new generation of weapons under the Reliable Replacement Warhead Program. Operational and capital costs would increase dramatically (as would deferred environmental costs, as hundreds of contaminated, obsolete buildings were torn down). Early, partial, and unconfirmed estimates pegged the cost of this effort at \$175 billion. When the U.S. Government Accountability Office (GAO) examined these figures in 2006, it found that the models used “are not currently designed to provide overall life-cycle cost estimates. In addition, this study found, among other things, that the cost data used in the models have a high degree of uncertainty associated with them and that the models do not currently have the ability to provide any confidence intervals around their estimates.”²²

DEFERRED ENVIRONMENTAL AND HEALTH COSTS

FIGURE 11



Deferred environmental and health costs encompass all the costs associated with managing and cleaning up the large quantities of radioactive and toxic wastes generated by nuclear weapons testing, production, and deployment activities, along with the costs of four separate programs to compensate civilian, military, and contractor employee victims of nuclear weapons testing and production.

Deferred environmental and health costs are a direct consequence of the government ignoring the dangers associated with the atmospheric testing and mass production of nuclear weapons during the Cold War. Had these known problems and risks been addressed at the time they were created, less land and water would have been contaminated and fewer people, including most notably the employees of the weapons factories, would have been injured or killed. Moreover, costs today would be significantly lower (it is noteworthy that the DOE's current annual nuclear weapons-related environmental costs are nearly identical to the current annual costs to sustain operations at the weapons production complex). Unfortunately, official acknowledgment of the problems as well as efforts to address them in a systematic and significant way were delayed until the late 1980s and early 1990s, when the weapons complex largely ground to a halt under the weight of decades of neglected health, safety, and environmental problems.

For FY 2008, \$8.3 billion was budgeted to deal with these issues, nearly 16 percent of the total, shared among eight departments and agencies (see Table 2):

- DOE Environmental Management, \$6.2 billion.
- DOD Environmental Programs, \$1.1 billion (estimated).
- Environmental Protection Agency (EPA), Superfund, \$24.7 million.
- DOE Defense Nuclear Waste Disposal, \$258.8 million.
- Defense Threat Reduction Agency, Nuclear Test Personnel Review (NTPR), \$15.8 million.
- Department of Justice, Radiation Exposure Compensation Program (RECP), \$40 million.²³
- Department of Labor/HHS, Energy Employees Occupational Illness Compensation Program Act (EEOICPA), \$637.3 million.
- Department of the Interior, Marshall Islands Trust Fund and Enewetak Atoll compensation, \$11.1 million.

TABLE 2. *Federal Appropriations for Deferred Environmental and Health Costs, FY 2008 (billions of dollars; does not add due to rounding)*

Total	8.299
Environmental management and cleanup (DOD, DOE, DNFSB, EPA)	7.333
Defense nuclear waste disposal (DOE)	0.259
Victim compensation (NTPR, RECP, EEOICPA, Marshall Islands)	0.708

Seventy-five percent of the total costs in this category—\$6.2 billion—go toward the DOE’s environmental management program to address radioactive and toxic wastes left behind after decades of nuclear weapons production at places like Hanford, Washington, Savannah River, South Carolina, and the Idaho National Laboratory, near Idaho Falls. As noted above, these costs will rise in future years as hundreds of older, disused facilities are decontaminated and demolished. At the Oak Ridge National Laboratory in Tennessee alone, plans call for tearing down more than 400 aging buildings comprising 5 million square feet of space and decontaminating the groundwater, at an estimated cost of \$9.4 billion to \$14.5 billion over twenty years.²⁴

The DOD cleanup effort accounts for 12.7 percent of the total—just under \$1.1 billion. However, attributing the DOD’s cleanup costs to particular installations or bases, let alone nuclear bases, is all but impossible using open source documents. Nuclear cleanup costs are not disaggregated, and it appears that the costs to clean

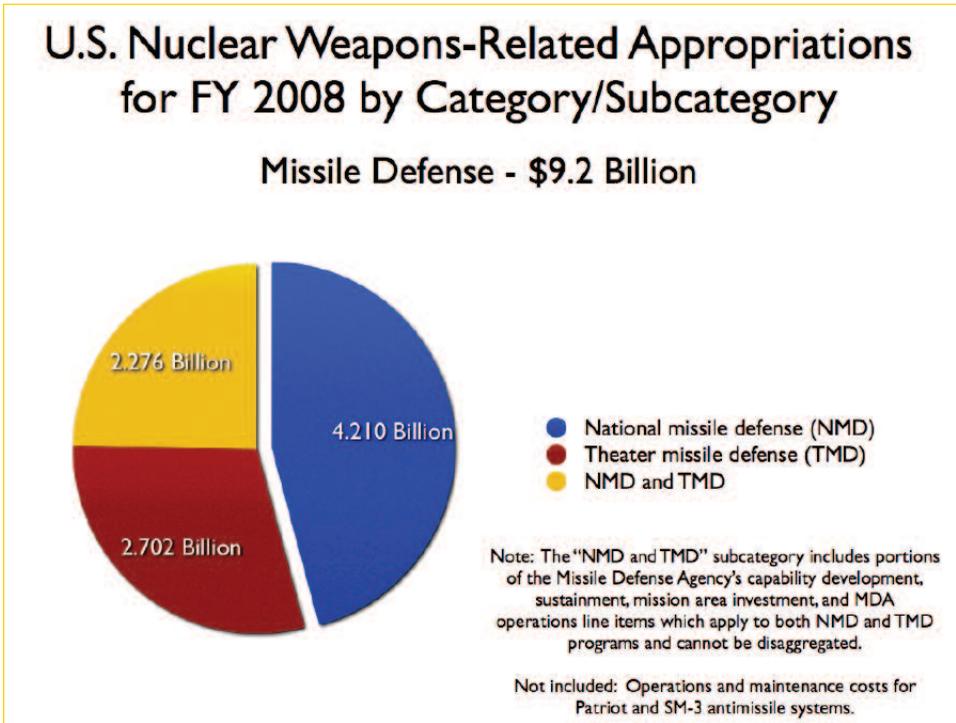
up after particular weapons are decommissioned are allocated to that weapon's program element number (the account code the DOD uses to prepare budgets and track costs). So to derive the figure for this study, a necessarily imperfect method has been adopted. Because nuclear weapons spending accounted for about 29 percent of all DOD spending historically, the relevant portions of the Defense Environmental Program budget for FY 2008 were multiplied by that percentage, yielding the figure above.²⁵

Also worth noting is that the costs to provide medical care and compensate the soldiers, sailors, and airmen who participated in one or more nuclear weapons tests and were exposed to dangerous levels of radiation are not included. Between 1946 and 1962, approximately 230,000 military, civilian, and contract personnel participated in atmospheric nuclear tests in the Pacific Ocean and at what is now the Nevada Test Site. These atomic veterans are eligible for compensation and care for illnesses connected to their exposure as a consequence of nuclear testing, but unlike the compensation programs established by the Justice and Labor departments, for civilian downwinders and DOE employees, respectively, the Department of Veterans Affairs does not make public any figures on its program. This is because the department's claims system only tracks individual veterans (whose records are shielded by privacy laws), and it has never attempted to aggregate claims by type, specifically those related to nuclear testing. As a consequence, no one knows how many veterans have applied for compensation, how many are receiving it, or what the annual and cumulative costs of this care might be.²⁶

Finally, this study estimates that \$637.3 million was budgeted for EEOICPA in FY 2008 to perform dose reconstruction studies and issue claims. Because this is an entitlement program and not all costs are budgeted, estimates were necessary. However, this estimate may be too low. An official government web site pegs the cost for FY 2008 at \$1.1 billion.²⁷

MISSILE DEFENSE

FIGURE 12



Missile defense covers all the costs associated with developing and deploying defenses to intercept long- and short-range ballistic missiles. Although these missiles may not necessarily be armed with nuclear warheads, the nuclear threat is a major motivating force behind the program, especially for efforts to defend the United States. Indeed, if no country presented a nuclear-armed ballistic missile threat to the United States, it is doubtful that the program would be proceeding at its current scale and pace.

At nearly \$9.2 billion, missile defense costs are 17.5 percent of the overall nuclear weapons-related budget. More significantly, this amount is 56 percent greater than the amount allocated for all nuclear threat reduction activities (see Table 3).

TABLE 3. *Federal Appropriations for Missile Defense, FY 2008 (billions of dollars)*

Total	9.188
National missile defense	4.210
Theater missile defense	2.702
National and theater missile defense	2.276 ²⁸

Although the military continues to maintain other forms of active defense against nuclear attack, they are not considered in this report. For example, the Navy still operates an antisubmarine warfare program, but one that is sharply reduced from its Cold War days. Moreover, given the multiple missions for attack submarines today and the lack of transparency in the Navy's budget, one can only guess at the partial costs for the nuclear weapons-related antisubmarine warfare mission today—hence its omission. (To be fair, the Navy itself would probably find it difficult to apportion costs between nuclear and non-nuclear missions in this area.)

Air defense also remains an important component of U.S. defenses. After 9/11, the DOD launched Operation Noble Eagle, one component of which was round-the-clock air patrols over New York, Washington, and a few other cities. This program lasted for about six months, after which patrols became less frequent. The cost of the continuous patrols was reported by the Congressional Research Service to be \$1.3 billion (in unadjusted dollars).²⁹ Separately, *Air Force Magazine* published charts in October 2007 and June 2008 documenting Noble Eagle sorties in various ways and providing some limited insight into the operation's tempo during part of FY 2008.³⁰ In September 2008, the GAO reported that Noble Eagle's costs for the first nine months of FY 2008 were about \$107 million, which assuming a steady rate of expenditures would make them less than \$150 million for the entire year.³¹ However, this figure is not counted in the totals in this report because there is no direct connection between current or foreseen nuclear threats and the maintenance of this effort. It is important to note that the DOD has no clear idea what it spends on air defense, because there is no centralized budget category for this program and the costs vary based on the type of aircraft flown, whether they are operated and maintained by active-duty or Air National Guard personnel, hours of flying time, personnel costs, and the like.

The missile defense costs presented here are primarily those for the Missile Defense Agency (MDA), but they also include \$81.4 million for three Air Force programs and one Defense Advanced Research Projects Agency program that have missile defense applications: the Experimental Satellite Series (XSS), the Autonomous Nanosatellite Guardian for Evaluating Local Space (ANGELS), the Starfire Optical Range, and Tiny Independent Coordinating Spacecraft (TICS).

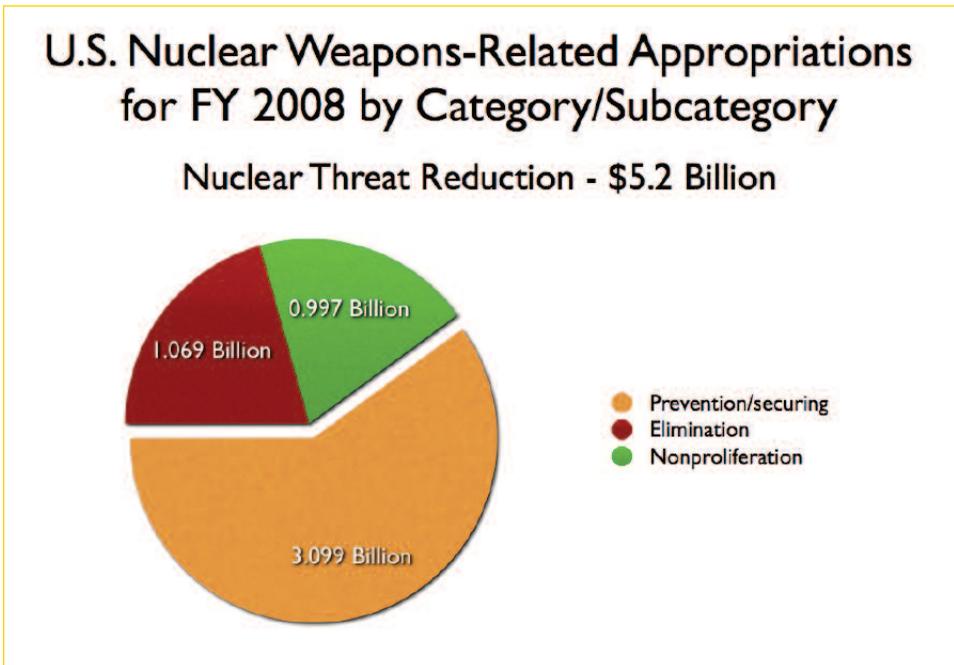
The MDA is pursuing both national missile defense (NMD), to protect U.S. and allied territory from long-range ballistic missile attack, and theater missile defense (TMD), to provide protection to troops on the battlefield, other tactical forces, and U.S. allies. Using the MDA's own data, this study estimates that 45.8 percent (\$4.2 billion) of its budget in 2008 was for NMD, including building, testing, and deploying ground-based interceptors at Fort Greely, Alaska, and associated infrastructure and operating costs at other locations (\$279.2 million in FY 2008),

and operating and testing the massive Sea Based X-Band Radar (\$165.2 million in FY 2008), while 29.4 percent (\$2.7 billion) was for TMD. Another 24.8 percent (\$2.3 billion) went toward various research and supporting programs that apply to both categories or cannot otherwise be disaggregated. Although the MDA's budget includes operations and maintenance costs for the ground-based interceptors in Alaska and California and related components, it does not include the operational costs of the Patriot system for TMD, which is maintained by the Army, or the Standard Missile-3 (SM-3) system, deployed on the Navy's Aegis guided missile cruisers. Thus the total for this category undercounts the full expense of the missile defense program.

Thus far, Congress has declined to fund an expansion of the ground-based system to be based in Poland and the Czech Republic. If the Obama administration chooses to continue the Bush administration's plans, costs in future years will increase significantly.³²

NUCLEAR THREAT REDUCTION

FIGURE 13



Nuclear threat reduction is broken down into three subcategories:

- **Prevention/securing:** activities to prevent the misuse of nuclear weapons or weapons materials in the United States and abroad, in part by securing them against theft or diversion.³³
- **Elimination:** activities to eliminate weapons or weapons materials in the United States and abroad to prevent their misuse.
- **Nonproliferation:** activities to curb and roll back the proliferation of nuclear weapons, materials, technology, or expertise.

With appropriations of almost \$5.2 billion, nuclear threat reduction accounts for less than 10 percent of the 2008 nuclear security budget. Sixty percent of this amount went toward prevention and security measures, 20.7 percent was allocated for eliminating nuclear dangers, and 19.3 percent was allocated for nonproliferation activities (see Table 4).

TABLE 4. *Federal Appropriations for Nuclear Threat Reduction, FY 2008*
(billions of dollars)

Total	5.165
Prevention/securing	3.099
Elimination	1.069
Nonproliferation	0.997

Notwithstanding the relatively small size of this category, over the last ten to fifteen years it has probably created more permanent, tangible security benefits than the other categories combined. Included here is the NNSA's entire defense nuclear nonproliferation program, which focuses on Russia and the former Soviet republics, as well as the DOD's CTR program, DOE's MCP&A program, and the State Department's nonproliferation-related activities, including support for disabling and dismantling North Korea's nuclear infrastructure and securing its plutonium-bearing nuclear fuel rods.³⁴

Since its inception in the early 1990s, for example, CTR has been responsible for assisting Russia and the former Soviet Union with:

- deactivating nearly 7,300 warheads,
- destroying 728 intercontinental ballistic missiles (ICBMs) and eliminating 496 ICBM silos and 137 ICBM mobile launchers,
- destroying 631 submarine-launched ballistic missiles (SLBMs) and 456 SLBM launchers,
- eliminating 155 strategic bombers, and
- sealing all the test holes (194) at the main nuclear test site in Kazakhstan.³⁵

To be sure, Russia still maintains a large and capable nuclear arsenal—an estimated 13,000 warheads (4,955 of which are considered operational—2,876 strategic and 2,079 tactical—with 8,045 held in reserve or awaiting dismantlement) along with an estimated 390 ICBMs, 176 SLBMs on 12 ballistic missile submarines, and 78 strategic bombers. But these numbers would be higher, and the resulting risk of theft or diversion greater, without the assistance provided under CTR.³⁶ Still, when considered in context, CTR's contributions, while commendable and worthy of support, are relatively modest and have had a limited impact on the overall threat posed by the Russian nuclear arsenal. And while overall program funding has been relatively steady in recent years, the share of these funds directed toward reducing biological weapons threats now exceeds forty-four percent.

The NNSA's defense nonproliferation programs, along with CTR and programs managed by the State Department, have also provided significant assistance to Russia over the years, including tightening security for loosely guarded stockpiles of plutonium and highly enriched uranium, enabling the shutdown of plutonium-producing reactors, aiding in the dismantlement of surplus nuclear-powered submarines, and providing funds for non-nuclear weapons-related work for tens of thousands of Russian weapons scientists and engineers.

Unlike missile defense, these programs can be effective before a threat materializes. Indeed, their entire purpose is to reduce and eliminate dangers before they can become a global concern. And yet missile defense in 2008 received 56 percent more funding than the activities described in this section. As *Global Security Newswire* reported in October 2008, Richard J. Danzig, former secretary of the Navy and an adviser to President-elect Obama, said that expenditures on national missile defense were "warranted to some extent." But he noted that "the Pentagon invests less than \$1 billion annually on what he termed 'the critical mission of reducing our risks from so-called 'loose nukes.' 'Is that the right proportion for what you want in your defense budget?' Danzig said. 'Look how you could increase the one by 50 percent if you reduce the other by five percent.'"³⁷

The Bush administration's Proliferation Security Initiative to develop a coordinated effort to detect, intercept, and apprehend illicit shipments of nuclear weapons or weapons materials has no budget of its own. Instead, the costs associated with PSI exercises and operations come from the annual operating costs of the ships and aircraft involved in the exercise, and from the agencies that manage it. This effort would appear to have significant potential, but absent an annual accounting of its costs and benefits, and the creation of a set of metrics to evaluate its impact, it is difficult to know if this is a wise use of resources or if and to what degree the program requires additional resources to become more effective.

Also included here are the costs of major efforts overseen by the Department of Homeland Security (DHS) to screen all cargo containers bound for the United States for radiation and to install radiation portal monitors at entry points to the United States to screen vehicles for the presence of radioactive material, at a cost of almost \$286 million in FY 2008 (a September 2008 GAO report estimates the cost of the radiation portal monitor program between 2007 and 2017 could be as much as \$3.8 billion, while the cost of the cargo monitors over the same time frame could exceed \$2 billion). Some observers argue that such programs are both a waste of money—because the most likely form of a terrorist nuclear bomb would utilize highly enriched uranium, which emits relatively little radiation and can be easily shielded—and a dangerous diversion from more critical efforts to lockdown and eliminate "loose nukes" overseas before they can reach U.S. shores. The

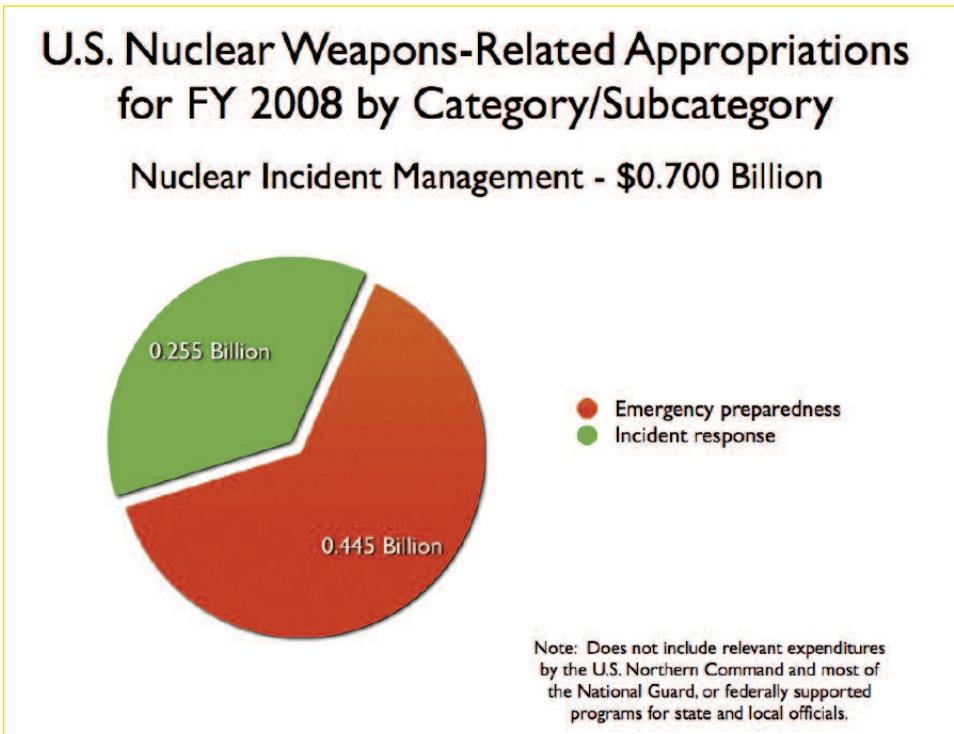
scanners also generate a large number of false alarms (as high as 20 to 30 percent, according to some reports), each of which must be investigated by U.S. Customs and Border Patrol officials. Others, including DHS officials, note that while no system is foolproof, erecting multiple barriers to aspiring nuclear terrorists increases the odds they will be caught and may even deter them from attempting to bring nuclear materials or weapons into the United States. The GAO has been critical of the DHS plans, noting that the detectors are not as accurate as advertised and that their overall acquisition and operating costs are significantly higher than initial estimates.³⁸

Funds in this category are also used to develop technology to verify arms reduction agreements and nuclear safeguards, and to secure and eliminate weapons-usable materials in the United States. This includes the DOE's Advanced Fuel Cycle Initiative, a controversial and expensive program to turn surplus plutonium into fuel to power energy-producing reactors. The nonproliferation subcategory includes a percentage of the support the United States provides to the International Atomic Energy Agency for nuclear safeguards and other activities—\$95.8 million.³⁹ And the elimination subcategory includes the \$134.7 million the NNSA budgeted for dismantlement and disposition activities associated with U.S. warheads. Also included, although not explicitly counted, are classified efforts to assist Pakistan in securing its nuclear arsenal and materials against theft or unauthorized use, a matter of increasing concern in recent years. In September 2008, the *New York Times* reported that a covert U.S. program to work with Pakistan's Nuclear Command Authority to increase the security of its nuclear arsenal had already spent "more than \$100 million."⁴⁰

As with some of the other categories of spending assessed in this report, there are uncertainties here about actual expenditures. A prime example is the counterterrorism work of the Federal Bureau of Investigation (FBI). Because the FBI does not break down its budget by specific type of terrorism, this report conservatively allocates 20 percent of the overall counterterrorism division budget (\$551.9 million) and one-third of the budget of the division's Weapons of Mass Destruction Directorate (\$16.3 million). Given the size of the FBI's counterterrorism budget relative to the size of the overall category, modest shifts in either direction would have important implications for total spending on nuclear threat reduction.

NUCLEAR INCIDENT MANAGEMENT

FIGURE 14



Nuclear incident management includes the costs of preparing for a nuclear or radiological attack against the United States, including continuity of operations programs, and efforts to detect and defuse terrorist weapons (see Table 5). These activities, which make up 0.008 percent of all nuclear weapons–related costs in 2008, fall under the “emergency preparedness” subcategory. In addition, this category covers the development of technology to trace the source of radioactive materials used in such weapons, and medical and other response programs to deal with the aftermath of attacks. These fall under the “incident response” subcategory and account for 0.005 percent of all nuclear weapons–related expenses. There is some fluidity between these categories, however, and it is not always easy to ascertain where preparedness stops and response begins. Other analysts may therefore allocate programs differently.

TABLE 5. *Federal Appropriations for Nuclear Incident Management, FY 2008*
(billions of dollars)

Total	0.700
Emergency preparedness	0.445
Incident response	0.255

It is extremely difficult to accurately portray the budget being spent by the United States on nuclear incident management programs. The main reason is that the key federal departments responsible for preparing and responding to a nuclear incident operate under a “comprehensive all-hazards planning” approach for all public health and medical emergencies resulting from natural or human causes. This report has therefore estimated costs for some agencies (particularly the DHS and HHS), based on the roles assigned to the various offices and programs. The other obstacle to accurately calculating this budget is that there is no way of knowing the full costs of responding to a nuclear incident until after one has happened (although several analysts have estimated they might be several hundred billion to several trillion dollars, depending on the location of the attack and the size and type of the weapon used. These estimates also consider the costs of regional, national, and even international economic disruption caused by an attack).⁴¹

Preparedness and response activities for a nuclear incident will be complex and involve numerous players—federal, state, and local, from various departments, as detailed under the National Response Framework base plan and Incident Annexes, which include the Radiological and Nuclear Incident Annex. At present, very little is being spent specifically to prepare for or deal with the aftermath of a nuclear or radiological attack as opposed to other hazards, at least as reflected in publicly available budget documents.

During the past two years, an increasing number of programs have been created to address various components of the challenge. Networks of radiation sensors have been installed in key parts of New York, Washington, and other cities, and sensor technology research continues.

The DOE’s Nuclear Weapons Incident Response program (\$158.7 million), which includes the Nuclear Emergency Support Team, is ready on short notice if a nuclear threat on U.S. soil materializes. This team—which is staffed by volunteers from the nuclear weapons laboratories and armed with schematics of many foreign nuclear devices and some conjectural terrorist ones, and which was deployed in the days and weeks after 9/11 and since then has been present at major public events—

searches for telltale radiation signatures and would attempt to locate and then disarm a terrorist device.⁴²

Every federal department has been tasked with establishing a continuity-of-operations plan (COOP). The Federal Emergency Management Agency also has a COOP, which is a set of contingency plans and a network of secret-hardened facilities for each government agency located in an arc around Washington, along with teams of staff to be deployed there (as they were for months after 9/11) to ensure that critical government functions will continue in the event of a devastating attack, whether nuclear or non-nuclear. Because a radiological and especially a nuclear attack is the only incident capable of severely disrupting or destroying large portions of the federal government, the full cost of this effort is included here.

Not included in this category are the costs for the U.S. Northern Command, which is the primary DOD command responsible for supporting federal, state, or local response activities, or for most of the National Guard, which would likely be heavily involved in response efforts in the event of a nuclear or radiological attack (the U.S. Pacific Command would respond to events in Hawaii, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and other territories throughout the Pacific Ocean). This is not because they are not important, but solely because the relevant amounts of money are not readily discernible from publicly available documents.

In October 2008, the DOD announced that the Northern Command had activated the first of three specialized units, each comprising 4,000 to 6,000 personnel, to “assist civil authorities in the response to chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) incidents in the U.S. homeland.”⁴³ The units, known as CBRNE Consequence Management Forces, are capable of responding to a wide range of incidents and can perform multiple functions, including “radiological assessment; decontamination and security of a contaminated site or area; medical triage, treatment, and care; and transportation and logistical support.”⁴⁴ Even if the activation of this unit had occurred in FY 2008, ascertaining how much of its operating costs to allocate to nuclear incident management, assuming such costs are readily available, would not be easy given the variety of events it is intended to address and the fact that personnel costs for this function may not be disaggregated from general military personnel costs. A December 2008 report in the *Washington Post* stated that in late 2007, Deputy Defense Secretary Gordon England “signed a directive approving more than \$556 million over five years to set up the three response teams.”⁴⁵

In June 2008 testimony before the Senate Homeland Security and Governmental Affairs Committee, Paul McHale, the assistant secretary of defense for homeland

defense, described in detail the numerous military components charged with responding to a nuclear terrorist attack on the United States:

- National Guard Weapons of Mass Destruction—Civil Support Teams (55 in all, one in each state and territory with two in California, consisting of 22 “highly skilled, full-time members of the Army and Air National Guard”);
- National Guard CBRNE Enhanced Response Force Packages (17 in all, “task-organized units of 200–400 personnel with combat support and service support mission essential tasks”);
- Joint Task Force Civil Support (a standing task force of 186 military personnel headquartered at Fort Monroe, Virginia, intended to deploy to a CBRNE incident site and assume control of assigned Federal military forces);
- U.S. Army Technical Escort Battalions (U.S. Army units capable of deploying task-organized teams within and without the continental United States to characterize CBRNE hazards, monitor risks, and support the disabling and elimination of threats).⁴⁶

Given the scale of these efforts, it is likely that the DOD expends hundreds of millions of dollars annually on them (although not all of this would be attributable to nuclear incident response). Unfortunately, the specific budgets for these activities, if they exist, are generally not available in public budgetary documents. Moreover, because some preparations will be the same whether the anticipated disaster results from a nuclear incident or another cause, even the DOD is likely to find it difficult to apportion costs specifically to possible nuclear disasters. Accordingly, most of these costs are not directly documented in this report. Also not included are the costs associated with federally supported preparedness activities for local and state first responders (that is, fire, medical, and law enforcement personnel). This includes all-hazards (including nuclear) training, exercises, equipment, and related activities associated with responding to major incidents, for which the DHS and HHS federal cooperative agreement programs have provided billions of dollars in recent years.

RECOMMENDATIONS

Neither the executive branch nor Congress can plan effectively or conduct essential oversight without understanding the comprehensive costs of the broad array of U.S. nuclear weapons and weapons-related programs. Yet, since the creation of the nuclear weapons program during World War II, a comprehensive accounting of nuclear costs has never been available to decision makers, and only rarely have officials requested one. What follows are four key recommendations for policy makers to consider that, if implemented, would help bring some rationality and accountability to the budgeting and oversight process and support more effective policy implementation.

CREATE COMPREHENSIVE NUCLEAR ACCOUNTING SYSTEMS

Congress should require the executive branch to prepare and submit annually, in conjunction with the annual budget request, an unclassified and classified accounting of all nuclear weapons–related spending for the previous fiscal year, the current fiscal year, and the next fiscal year. The DOD, using its Future Years Defense Program, should project its nuclear weapons–related spending five or six years into the future.

A senior White House official—perhaps within the congressionally mandated office to coordinate nuclear proliferation and counterterrorism efforts or the National Security Council—should be responsible for overseeing this annual exercise, in conjunction with relevant officials of the Office of Management and Budget and senior budget officials of key departments and agencies.⁴⁷

In this regard, it is worth noting that the 1999 Commission to Assess the Organization of the Federal Government to Combat the Proliferation of Weapons of Mass Destruction, headed by former director of central intelligence, John Deutch, noted, “There is no system for tracking resource expenditures for combating proliferation. Doing so is essential to an effective interagency effort.” Consequently:

No one in the Federal Government knows how much money we are spending to combat proliferation. The success of any campaign depends on the resources available to wage it, and on the ways in which those resources are brought to bear. Currently, however, no one decides what level of resources should be devoted to proliferation-related efforts, there is no overall plan for how those resources should be allocated and no consistent evaluation of the effectiveness of these expenditures.⁴⁸

If adopted, said the commission, such a system would result in a “more transparent process for tracking the application of resources to their intended purposes.”⁴⁹ Yet nearly a decade later, little to no progress has been made in this regard.

QUANTIFY NUCLEAR-RELATED INTELLIGENCE EXPENDITURES

The congressional armed services, defense appropriations, and intelligence committees, working with the intelligence community, should devise tools to better explain and quantify nuclear weapons–related intelligence expenditures. They should ascertain, to the greatest extent possible, how much is spent to enhance the effectiveness of operational nuclear forces, how much is spent supporting defensive operations related to nuclear weapons (missile defense, air defense, and antisubmarine warfare), and how much is spent supporting efforts to prevent and eliminate nuclear threats, and prepare and respond to nuclear incidents. Greater insight and transparency about these matters (at the very least within policy-making circles) could enhance understanding of U.S. intelligence capabilities and lead to a better allocation of intelligence assets to address urgent nuclear-related threats.

FOCUS ON PROACTIVE THREAT REDUCTION STRATEGIES

Greater fiscal and programmatic emphasis should be placed on programs that seek to secure and prevent the proliferation of nuclear weapons, weapons materials, and technical knowledge, and to eliminate threats posed by such weapons, materials, and knowledge. Such programs—notably the DOD’s CTR program and the DOE’s MPC&A program—have a demonstrated record of success, are proactive, are more cost-effective than technology-driven efforts such as missile defenses, and can be implemented quickly and at a relatively modest cost to ensure significant security gains today and in the future. The bipartisan Russia Task Force of the Secretary of Energy Advisory Board, co-chaired by former senator Howard Baker (Republican of Tennessee) and former White House counsel Lloyd Cutler, recommended in January 2001 that

the President, in consultation with Congress and in cooperation with the Russian Federation, should quickly formulate a strategic plan to secure and/or neutralize in the next eight to ten years all nuclear weapons-usable material located in Russia and to prevent the outflow from Russia of scientific expertise that could be used for nuclear or other weapons of mass destruction.... This program could be carried out for less than one percent of the U.S. defense budget, or up to a total of \$30 billion over the next eight to ten years.... The national security benefits to U.S. citizens from securing

and/or neutralizing the equivalent of more than 80,000 nuclear weapons and potential nuclear weapons would constitute the highest return on investment in any current U.S. national security and defense program.⁵⁰

These recommendations—as with the Deutch Commission’s recommendations—were not implemented, although more limited funding has continued to flow to such programs over the years, resulting in smaller but still notable security benefits. These efforts currently receive adequate funding for their limited scope, but increased funding, as recommended above, will be required to implement President-elect Obama’s pledge to “lead a global effort to secure all nuclear weapons and material at vulnerable sites within four years.”⁵¹

In addition, if the Obama administration chooses to continue the Bush administration’s Proliferation Security Initiative (PSI) it should establish clear metrics to track its accomplishments and submit a detailed accounting of the previous year’s expenses for the program with future budget requests. At present, costs associated with PSI exercises and operations are paid for out of the annual operating funds for the vessels and aircraft that participate (the specific costs to oversee the effort at the DOD, the State Department, and other federal agencies are unknown but are probably captured, at least in part, under the nuclear threat reduction category in this report). Given the nature and purpose of the PSI, it may not be feasible to anticipate all costs in advance, but knowing how much has been spent to achieve the program’s benefits is essential for accountability and success.

ENSURE EQUITY FOR ATOMIC VETERANS

Finally, almost nothing is known about the costs of compensating and caring for veterans who were exposed to radiation as a direct consequence of their participation in atmospheric nuclear testing activities from the middle 1940s until the early 1960s—in contrast to programs created to compensate civilians injured by atmospheric nuclear weapons tests or workers at the DOE’s nuclear weapons production facilities who were exposed to dangerous levels of radiation or toxic chemicals. Congress should require the Department of Veterans Affairs to provide accurate historical and current accountings of the number of veterans requesting and receiving compensation and care for injuries and illnesses attributable to exposure to radiation from U.S. nuclear weapons tests, including the cost of such compensation and care. Aggregated cumulative and annual figures for those whose claims have been denied should also be published, to enable comparisons with the other weapons-related compensation programs administered by the Department of Justice (Radiation Exposure Compensation Program) and Department of Labor (Energy Employees Occupational Illness Compensation Program Act).

Implementing these recommendations will increase understanding and accountability, which in turn will lead to stronger public and congressional support for critical nuclear security programs and a more balanced and effective allocation of public resources. When combined with a new focus on nuclear policy matters, including the administration's forthcoming Nuclear Posture Review, such efforts will help to ensure that U.S. political and fiscal nuclear priorities are properly aligned.

CONCLUSION

This report has sought to establish an analytical framework and parameters for a more comprehensive accounting of government spending on nuclear security, as recommended above, to enable a fully informed and more prioritized approach to spending and more effective oversight of these efforts. The report was prepared in less than a year with very limited resources and circumscribed access to detailed budgetary information—not an easy undertaking, but not excessively difficult. It has tried to use clear, non-ideological language to illuminate some of the lesser corners of the nuclear realm, and it has raised critical questions about the future direction of and expenditures for U.S. nuclear weapons and weapons-related programs. Those involved with preparing this report hope that the Obama administration and the 111th Congress will rise to the challenge and conduct an official, comprehensive nuclear audit.

NOTES

1. See pages 16–17 for a discussion of how these numbers were derived. A downloadable spreadsheet containing all the budgetary data assembled for this report is available at www.carnegieendowment.org/nuclearsecuritybudget.
2. These percentages were calculated by dividing each agency's total FY 2008 appropriation—as documented in its FY 2009 budget request—by the actual and estimated nuclear weapons and weapons-related expenses. If the agency denominators are instead drawn from the Office of Management and Budget's historical spending tables (submitted with the administration's FY 2009 budget request), the DOE and DHS percentages increase to 75 percent and 2.2 percent, respectively.
3. Some argue that the U.S. nuclear arsenal prevents proliferation by providing a “nuclear umbrella” for U.S. allies who might otherwise acquire nuclear weapons. Speaking at the Carnegie Endowment for International Peace on October 28, 2008, Secretary of Defense Robert Gates said, “[A]s long as others have nuclear weapons, we must maintain some level of these weapons ourselves to deter potential adversaries and to reassure over two dozen allies and partners who rely on our nuclear umbrella for their security, making it unnecessary for them to develop their own.... While some may not see a real nuclear threat to the United States today, we should be mindful that our friends and allies perceive different levels of risk within their respective regions. Here our arsenal plays an irreplaceable role in reducing proliferation.” Carnegie Endowment for International Peace, “Nuclear Weapons and Deterrence in the 21st Century,” October 28, 2008; www.carnegieendowment.org/files/1028_transcrip_gates_checked.pdf. See also, Department of State, International Security Advisory Board, “Report on Discouraging a Cascade of Nuclear Weapons States,” October 19, 2007, p. 23; www.state.gov/documents/organization/95786.pdf.
4. Senator Barack Obama, “The American Moment,” speech before the Chicago Council on Global Relations, April 23, 2007; www.thechicagocouncil.org/dynamic_page.php?id=64.
5. Most Americans are unaware that the United States continues to field a sizable nuclear arsenal. In a poll conducted in September 2007, when asked, “Just your best guess: how many nuclear weapons do you think [your country] has?” the median response from more than 1,200 respondents was 1,000. See Steven Kull et al., “Americans and Russians on Nuclear Weapons and the Future of Disarmament,” Joint Study of WorldPublicOpinion.org and Advanced Methods of Cooperative Security Program, CISSM, WorldPublicOpinion.org, November 9, 2007, 8; www.worldpublicopinion.org/pipa/articles/international_security_bt/432.php?lb=btis&pnt=432&nid=&id=.
6. See, for example, Bob Graham and Jim Talent, et al., *World at Risk: The Report of the Commission on the Prevention of WMD Proliferation and Terrorism* (New York: Vintage Books, 2008); www.preventwmd.gov/report/.
7. Stephen I. Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons since 1940* (Washington, D.C.: Brookings Institution Press, 1998).
8. The U.S. nuclear arsenal currently comprises an estimated 3,374 warheads and bombs—2,874 strategic and 500 tactical—(along with 1,830 warheads in inactive reserve, and another 4,400 retired and awaiting dismantlement), 450 Minuteman intercontinental ballistic missiles, 288 Trident II D5 submarine-launched ballistic missiles, 114 B-2A and B-52H bombers (60 of which are considered primary mission capable), and 14 Ohio-class ballistic missile submarines. See Robert S. Norris and Hans M. Kristensen, “U.S. Nuclear Forces, 2008,” *Bulletin of the Atomic Scientists* 64 (March/April 2008): 50–53, 58. E-mail communication with Hans M. Kristensen, December 9, 2008.
9. Budget authority is the authority to incur financial obligations; outlays occur when the payments toward those obligations are actually made. For example, Congress might grant the Navy the budget authority to purchase a ship in FY 2008, but the outlays for building that ship would occur over a period of several years.
10. The DNFSB budget provides no specific breakdown of how much it expends at which facilities, so it is difficult using publicly available information to be more specific than this. The DNFSB is also responsible for ensuring the safety of warhead dismantlement activities, which fall under the “elimination” subcategory of “nuclear threat reduction.” Here too, however, the agency's budget offers

- no guidance on what such oversight activities cost. In the interest of simplicity, and because warhead dismantlement is at present a relatively modest activity for the NNSA (less than \$135 million out of a \$6.8 billion budget), no effort is made to allocate DNFSB costs to dismantlement.
11. Also included in MFP 1 are the costs associated with 66 B-1B bombers, whose ability to carry nuclear weapons was removed in 2003-2004.
 12. One conservative estimate pegs the cost for nuclear-weapons-related intelligence operations and activities during the Cold War at \$500 billion (in constant 1996 dollars). See Bruce G. Blair, John E. Pike, and Stephen I. Schwartz, "Targeting and Controlling the Bomb," in *Atomic Audit*, ed. Schwartz, 225-261.
 13. Steven Aftergood, "DNI Discloses National Intelligence Program Budget," *Secrecy News*, October 30, 2007; www.fas.org/blog/secrecy/2007/10/dni_discloses_national_intelli.html. Office of the Director of National Intelligence, "DNI Releases Budget Figure for 2008 National Intelligence Program," October 28, 2008; www.dni.gov/press_releases/20081028_release.pdf. Peter Eisler, "Post-9/11 CIA Has Shifted Its Emphasis for Foreign Ops," *USA Today*, October 27, 2008; www.usatoday.com/tech/news/surveillance/2008-10-26-cia-gadgets_N.htm.
 14. Seymour M. Hersh, "Preparing the Battlefield," *New Yorker*, July 7 and 14, 2008, 61.
 15. For example, a reconnaissance satellite can observe an adversary's military forces in order to target nuclear weapons more effectively, to better understand capabilities, to provide early warning of a change in deployment or operating posture, or to verify an arms control agreement.
 16. Hans M. Kristensen, "U.S. Nuclear Weapons Withdrawn From the United Kingdom," FAS Strategic Security Blog, June 26, 2008; www.fas.org/blog/ssp/2008/06/us-nuclear-weapons-withdrawn-from-the-united-kingdom.php.
 17. Department of Defense, *National Defense Budget Estimates for the FY 2009 Budget (Green Book—Updated)*, 73; www.defenselink.mil/comptroller/defbudget/fy2009/FY09Greenbook/greenbook_2009_updated.pdf. These figures are for Total Obligational Authority. This estimate assumes that the nuclear forces get a "fair share" of each of those other categories. That may or may not be true. For example, nuclear forces may cost more to command and control but draw less on central management and supply than conventional forces.
 18. See National Research Council, Committee on Conventional Prompt Global Strike Capability, *U.S. Conventional Prompt Global Strike: Issues for 2008 and Beyond* (Washington, D.C.: National Academies Press, 2008); Elaine M. Grossman, "Strategic Arms Funds Tilt Conventional in 2009," *Global Security Newswire*, November 7, 2008; http://gsn.nti.org/gsn/ts_20081107_5200.php; Defense Science Board, "Report of the Defense Science Board Task Force on Future Strategic Strike Forces," February 2004; U.S. Government Accountability Office, *Military Transformation: Actions Needed by DOD to More Clearly Identify New Triad Spending and Develop a Long-term Investment Approach*, Report GAO-05-540 (Washington, D.C.: U.S. Government Accountability Office, 2005).
 19. Other Navy vessels with nuclear power plants include attack submarines and aircraft carriers, which no longer carry nuclear weapons.
 20. Department of Energy, "Fiscal 2009 Budget Request—Laboratory Tables (Preliminary), February 2008, 91-92, 143-145; www.cfo.doe.gov/budget/09budget/Content/Labandstate/FY2009lab.pdf. Until 2001, the DOE released annual warhead dismantlement figures. For an effort to calculate these costs in the early to middle 1990s, see Arjun Makhijani, Stephen I. Schwartz, and Robert S. Norris, "Dismantling the Bomb," in *Atomic Audit*, ed. Schwartz, 332-334.
 21. In the early 1990s, when significantly more warhead dismantlement work was under way, the estimated direct cost of such activities at Pantex and Y-12 combined was \$25 million in 1993 and \$30 million in 1994. These figures do not include indirect but essential support costs for transportation, security, maintenance, and oversight, and thus "probably fall short of the totals for the comprehensive mission of dismantlement." See Office of Technology Assessment, *Dismantling the Bomb and Managing the Nuclear Materials*, Report OTA-O-572 (Washington, D.C.: U.S. Government Printing Office, 1993), 44-45.
 22. U.S. Government Accountability Office, "Nuclear Weapons: Views on Proposals to Transform the Nuclear Weapons Complex," Statement of Gene Aloise, Director, Natural Resources and Environment, GAO-06-606T, April 26, 2006, 15.

23. Congress approved the Radiation Exposure Compensation Act (RECA) on October 5, 1990. RECA offers an apology and monetary compensation to individuals who contracted certain cancers and other serious diseases resulting from their exposure to radiation released during atmospheric nuclear weapons tests (\$50,000 to individuals residing or working “downwind” of the Nevada Test Site and \$75,000 for workers participating in aboveground nuclear weapons tests) or as a consequence of their occupational exposure while employed in the uranium industry during the Cold War (\$100,000). The RECA Trust Fund commenced operations in April 1992. As of December 2008, almost 29,400 claims have been filed and \$1.367 billion has been awarded to nearly 20,400 claimants. See U.S. Department of Justice, Civil Division, “Radiation Exposure Compensation Act Trust Fund: FY 2009 Performance Budget,” February 2008; www.usdoj.gov/jmd/2009justification/pdf/fy09-aeca.pdf. For more on RECP, see U.S. Government Accountability Office, *Radiation Exposure Compensation Act Program Status*, Report GAO-07-1037R (Washington, D.C.: U.S. Government Accountability Office, 2007).
24. Duncan Mansfield, “Weapons Plant, Lab Cleanup Gets Early OK,” *Oak Ridger.com*, November 20, 2008, www.oakridger.com/news/x776454241/Weapons-plant-lab-cleanup-gets-early-OK.
25. Schwartz, *Atomic Audit*, 3. See also Arjun Makhijani, Stephen I. Schwartz, and William J. Weida, “Nuclear Waste Management and Environmental Remediation,” in *Atomic Audit*, ed. Schwartz, 389–391.
26. Arjun Makhijani and Stephen I. Schwartz, “Victims of the Bomb,” in *Atomic Audit*, ed. Schwartz, 406. In FY 2008, the Department of Veterans Affairs received appropriations of \$37.1 billion for disability compensation and pensions and \$32.4 billion for medical services. The Defense Threat Reduction Agency continues to study potential exposures, the first step in filing a claim, through its Nuclear Test Personnel Review program, which began in 1978. See the discussion in the “Deferred Environmental and Health Costs” section above. See also Defense Threat Reduction Agency, “Nuclear Test Personnel Review (NTPR) Program;” www.dtra.mil/rd/programs/nuclear_personnel/index.cfm.
27. ExpectMore.gov, “Energy Employees Occupational Illness Compensation Program Assessment;” www.whitehouse.gov/omb/expectmore/detail/10009004.2007.html. For an in-depth look at significant problems many former DOE workers have faced in receiving compensation from this program, see “Deadly Denial,” a multi-part special investigative report by the *Rocky Mountain News* published in July 2008; www.rockymountainnews.com/special-reports/deadly-denial/.
28. This category includes portions of the Missile Defense Agency’s capability development, sustainment, mission area investment, and MDA operations line items which apply to both national and theater missile defense programs and cannot be disaggregated.
29. Amy Belasco, “The Cost of Iraq, Afghanistan, and Other Global War on Terror Operations Since 9/11,” Congressional Research Service, updated July 14, 2008, 24; www.fas.org/sfp/crs/natsec/RL33110.pdf.
30. “The Many Flights of Noble Eagle,” *Air Force Magazine*, October 1, 2007, www.airforce-magazine.com/datapoints/2007/Pages/dp100307one.aspx; “Flying Noble Eagle,” *Air Force Magazine*, June 1, 2008, www.airforce-magazine.com/datapoints/2008/Pages/dp061308one.aspx.
31. U.S. Government Accountability Office, *Global War on Terrorism: Reported Obligations for the Department of Defense*, Report GAO-08-1128R (Washington, D.C.: U.S. Government Accountability Office, 2008), 6.
32. For more on the long-term costs of missile defense, see U.S. Government Accountability Office, *Missile Defense: Actions Needed to Improve Planning and Cost Estimates for Long-Term Support of Ballistic Missile Defense*, GAO-08-1068 (Washington, D.C.: U.S. Government Accountability Office, 2008).
33. Although the DOD and the NNSA expend considerable sums—\$865 million in the case of the NNSA—to protect operational nuclear weapons and weapons-related materials and technology from theft or misuse, these costs are counted under the “nuclear forces and operational support” category with the understanding that they are part of the cost of maintaining a nuclear arsenal and to demonstrate the full cost of that decision. However, as with several types of programs documented in this report, they do fit in more than one category. In July 2008, a senior GAO official testified that “according to the DNDO [Domestic Nuclear Detection Office, part of DHS], approximately \$2.8 billion was budgeted in FY 2007 for the 74 programs [managed by the DOD, DOE, DNDO, and the State Department] included in the global nuclear detection architecture. Of this \$2.8 billion, \$1.1

- billion was budgeted for programs to combat nuclear smuggling internationally; \$220 million was devoted to programs to support the detection of radiation and nuclear materials at the U.S. border; \$900 million funded security and detection activities within the United States; and approximately \$575 million was used to fund a number of cross-cutting activities." See U.S. Government Accountability Office, Testimony of David C. Maurer, Acting Director, Natural Resources and Environment, "Nuclear Detection: Preliminary Observations on the Domestic Nuclear Detection Office's Efforts to Develop a Global Nuclear Detection Architecture," GAO-08-999T, July 16, 2008.
34. In April 2008, a senior NNSA official stated that costs associated with North Korean dismantlement activities would require \$50 million more than originally budgeted for FY 2008 and could rise to \$360 million in FY 2009 if anticipated efforts remained on schedule. See "US Estimates NK Disablement Cost of \$410 million," *Korea Times* (Yonhap News Agency), April 3, 2008.
35. See Senator Richard G. Lugar, Press Release, "Nunn-Lugar Update, October 2008," November 19, 2008; <http://lugar.senate.gov/press/record.cfm?id=305126&&>, and the accompanying "Nunn-Lugar Scorecard;" <http://lugar.senate.gov/nunnlugar/scorecard.html>.
36. Robert S. Norris and Hans M. Kristensen, "Russian Nuclear Forces 2008," *Bulletin of the Atomic Scientists*, May–June 2008, 54–62. E-mail communication with Hans M. Kristensen, December 9, 2008. For a detailed review of what has been done and remains to be done to eliminate nuclear dangers in Russia, the former Soviet republics, and the United States, see Matthew Bunn, *Securing the Bomb 2008*, Project on Managing the Atom (Cambridge, Mass.: Harvard University and Nuclear Threat Initiative, 2008); www.nti.org/e_research/cnwm/overview/cnwm_home.asp. For specific budgetary recommendations, see Miriam Pemberton and Lawrence Korb, *A Unified Security Budget for the United States, FY 2009*, Foreign Policy in Focus (Institute for Policy Studies), September 2008, 30–34.
37. Elaine M. Grossman, "Obama Eyes More WMD Defense Funds, Adviser Says," *Global Security Newswire*, October 3, 2008, http://gsn.nti.org/gsn/nw_20081003_7025.php.
38. See U.S. Government Accountability Office, *Combating Nuclear Smuggling: DHS Has Made Progress Deploying Radiation Detection Equipment at U.S. Ports of Entry, but Concerns Remain*, Report GAO-06-389 (Washington, D.C.: U.S. Government Accountability Office, 2006); U.S. Government Accountability Office, *Combating Nuclear Smuggling: DHS's Cost-Benefit Analysis to Support the Purchase of New Radiation Detection Portal Monitors Was Not Based on Available Performance Data and Did Not Fully Evaluate All the Monitors' Costs and Benefits*, Report GAO-07-133R (Washington, D.C.: U.S. Government Accountability Office, 2006); Testimony of Gene Aloise, Director, Natural Resources and Environment, Government Accountability Office, before the House of Representatives Homeland Security Subcommittee on Emerging Threats, Cybersecurity, and Science and Technology, GAO-07-581T, "Combating Nuclear Smuggling: DHS's Decision to Procure and Deploy the Next Generation of Radiation Detection Equipment Is Not Supported by Its Cost-Benefit Analysis," May 14, 2007; U.S. Government Accountability Office, *Combating Nuclear Smuggling: DHS's Phase 3 Test Report on Advanced Portal Monitors Did Not Disclose the Limitations of the Test Results*, Report GAO-08-979 (Washington, D.C.: U.S. Government Accountability Office, 2008); U.S. Government Accountability Office, *Combating Nuclear Smuggling: DHS's Program to Procure and Deploy Advanced Radiation Detection Portal Monitors Is Likely to Exceed the Department's Previous Cost Estimates*, Report GAO-08-1108R (Washington, D.C.: U.S. Government Accountability Office, 2008); Steve Coll, "The Unthinkable," *New Yorker*, March 12, 2007; www.newyorker.com/reporting/2007/03/12/070312fa_fact_coll; "DHS Exaggerated Nuclear Detector Ability, GAO Says," *Global Security Newswire*, October 30, 2008; http://gsn.nti.org/gsn/ts_20081030_4672.php; "Customs, Ports Screen for Bomb in a Box," *Cunningham Report*, November 30, 2008, www.cunninghamreport.com/news_item.php?id=618.
39. For a slightly dated but still useful examination of U.S. financial support of the International Atomic Energy Agency, see U.S. Government Accountability Office, *Nuclear Nonproliferation: IAEA Has Strengthened Its Safeguards and Nuclear Security Programs, but Weaknesses Need to Be Addressed*, Report GAO-06-93 (Washington, D.C.: U.S. Government Accountability Office, 2005).
40. David E. Sanger, "We May Miss Kim Jong-il (and Maybe Musharraf)," *New York Times*, September 14, 2008. During the recent political instability in Pakistan in 2006 and 2007, there were also sporadic reports based on anonymous sources that, if necessary, the United States could send specially trained military units into Pakistan to secure nuclear installations and weapons. The costs of such an effort, if they could be readily ascertained, might also be categorized as another form of defense.

41. Charles D. Ferguson and William C. Potter, *The Four Faces of Nuclear Terrorism* (New York: Routledge, 2005), 3–4; Elizabeth Eraker, “Cleanup After a Radiological Attack: U.S. Prepares Guidance,” *Nonproliferation Review* 11 (Fall–Winter 2004): 167–185; <http://cns.miis.edu/npr/pdfs/113eraker.pdf>; Ira Helfand et al., *The U.S. and Nuclear Terrorism: Still Dangerously Unprepared* (Washington, D.C.: Physicians for Social Responsibility, 2006), 18; Clark C. Abt, *The Economic Impact of Nuclear Terrorist Attacks on Freight Transport Systems in an Age of Seaport Vulnerability (Executive Summary)*, prepared for U.S. Department of Transportation / RSPA / Volpe National Transportation Systems Center (Bethesda, Md.: Abt Associates, 2003); www.abtassociates.com/reports/ES-economic_impact_of_nuclear_terrorist_attacks.pdf; H. Rosoff and D. von Winterfeldt, “A Risk and Economic Analysis of Dirty Bomb Attacks on the Ports of Los Angeles and Long Beach (Draft),” Report 05-027, Center for Risk and Economic Analysis of Terrorism Events, University of Southern California, October 23, 2005; Charles Meade and Roger C. Molander, *Considering the Effects of a Catastrophic Terrorist Attack* (Arlington, Va.: RAND Corporation Center for Risk Management Policy, 2006); www.rand.org/pubs/technical_reports/2006/RAND_TR391.pdf.
42. For more on the DOE’s capabilities, see U.S. Government Accountability Office, *Combating Nuclear Terrorism: Federal Efforts to Respond to Nuclear and Radiological Threats and to Protect Emergency Response Capabilities Could Be Strengthened*, Report GAO-06-1015 (Washington, D.C.: U.S. Government Accountability Office, 2006); CBS News, “On the Trail with the Nuke Hunters,” November 24, 2008; <http://cbs11tv.com/national/radiation.security.inauguration.2.873256.html>.
43. U.S. Department of Defense, “DOD Announces Assignment of Forces to US Northern Command,” press release, October 3, 2008; p. A1; www.defenselink.mil/releases/release.aspx?releaseid=12260.
44. *Ibid.*
45. Spencer S. Hsu and Ann Scott Tyson, “Pentagon to Detail Troops to Bolster Domestic Security,” *Washington Post*, December 1, 2008, p. A1.
46. Committee on Homeland Security and Governmental Affairs, U.S. Senate, “Statement by the Honorable Paul McHale, Assistant Secretary of Defense for Homeland Defense and Americas’ Security Affairs, June 26, 2008;” http://hsgac.senate.gov/public/_files/062608McHale.pdf.
47. Others have made similar suggestions. See, for example, Brian Finlay and Elizabeth Turpen, “Against All Odds: Preventing Terrorists from Getting Nuclear, Biological, and Chemical Weapons,” The Henry L. Stimson Center, 2009, p. 3; www.stimson.org/Presidential_Inbox_2009/Preventing_WMD_Terrorism_FINAL.pdf.
48. “Combating Proliferation of Weapons of Mass Destruction,” Report of the Commission to Assess the Organization of the Federal Government to Combat the Proliferation of Weapons of Mass Destruction, July 14, 1999, vi, 19.
49. *Ibid.*, vi.
50. U.S. Secretary of Energy Advisory Board, Russia Task Force, “A Report Card on the Department of Energy’s Nonproliferation Programs with Russia,” January 10, 2001, iv–v.
51. Senator Barack Obama, “The American Moment.”

APPENDIX

Note: The tables below are color-coded for easy reference. Blue denotes programs associated with nuclear forces and operational support. Lavender denotes programs associated with deferred environmental and health costs. Orange denotes programs associated with missile defense. Yellow denotes programs associated with nuclear threat reduction. And green denotes programs associated with nuclear incident management. These are the same colors used to depict these categories in figures one and two in the main text of the report.

TABLE 6. Total FY 2008 U.S. Nuclear Weapons Appropriations by Category/Subcategory (billions of dollars; may not add due to rounding)

Category/Subcategory	
Nuclear forces and operational support	29.093
Department of Defense	22.496
Department of Energy/National Nuclear Security Administration	6.659
Defense Nuclear Facilities Safety Board (DNFSB)	0.012
Department of the Interior (Kwajalein Atoll lease)	0.016
Deferred environmental and health costs	8.299
Environmental management and cleanup (DOD, DOE, DNFSB, EPA)	7.333
Defense nuclear waste disposal (DOE)	0.259
Victim compensation (NTPR, RECP, EEOICPA, Marshall Islands)	0.708
Missile defense	9.188
National missile defense	4.210
Theater missile defense	2.702
National and theater missile defense	2.276
Nuclear threat reduction	5.165
Prevention/securing (DOD, DOE, DHS, State, Justice, NRC)	3.098
Elimination (DOD, DOE, State)	1.069
Nonproliferation (DOD, DOE, State, Commerce)	0.997
Nuclear incident management	0.700
Emergency preparedness (DOD, DOE, DHS, HHS, EPA)	0.445
Incident response (DOD, DOE, DHS, EPA)	0.255
Grand total	52.445

TABLE 7. Total FY 2008 Nuclear Weapons Appropriations by Department/Agency (millions of dollars)

Category	Defense	Energy	Defense Nuclear Facilities Safety Board	Homeland Security	State	Justice	Commerce	Labor	Health and Human Services	Environmental Protection Agency	Nuclear Regulatory Commission	Interior	Total
Nuclear forces and operational support	22,495.652	6,569.325	11.936	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	16.190	29,093.103
Deferred environmental and health costs	1,069.007	6,501.513	11.936	n.a.	n.a.	43.400	n.a.	581.980	55.358	24.704	n.a.	11.117	8,299.015
Missile defense	9,187.509	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	9,187.509
Nuclear threat reduction	982.422	2,663.130	n.a.	625.880	241.826	568.102	11.760	n.a.	n.a.	n.a.	72.100	n.a.	5,165.220
Nuclear incident management	163.245	158.655	n.a.	280.887	n.a.	n.a.	n.a.	n.a.	63.270	33.587	0.000	n.a.	699.644
Total	33,897.835	15,892.623	23.872	906.767	241.826	611.502	11.760	581.980	118.628	58.291	72.100	27.307	52,444.491

TABLE 8. *Department of Defense*

Program	FY 2008 Appropriations (millions of dollars)
Major Force Program 1 (Strategic Forces)	10,057.000 ¹
Tactical nuclear weapons (estimate, not counted in total)	244.858 ²
Missile defense	9,187.509 ³
Command, control, communications, and intelligence (estimate, not counted in total)	13,059.092 ⁴
Overhead and support costs (estimate, nuclear forces only)	10,900.211 ⁵

NOTE: For the Air Force, Army, and Navy programs below, only those marked with an asterisk are included in the overall totals. The remaining programs are illustrative only.

Air Force

OPERATIONS AND MAINTENANCE	
Global C3I and Early Warning	1,277.318 ⁶
Primary Combat Forces	3,687.035 ⁷
Primary Combat Weapons	270.703 ⁸
Contract maintenance support—B-1B and B-52 bombers	30.361 ⁹
Weapons of Mass Destruction Threat Response*	33.263 ¹⁰

1. U.S. Department of Defense, "National Defense Budget Estimates for FY 2009," March 2008, 80; www.defenselink.mil/comptroller/defbudget/fy2009/fy2009_greenbook.pdf.
2. Derived from Congressional Budget Office, *The START Treaty and Beyond*, 1991, 135 (10 percent of total); Stockpile reduced from ~5,000 in 1991 to ~150–240 today (per the Federation of American Scientists).
3. Includes \$81.4 million for the Air Force's XSS, ANGELS, Starfire, and the Defense Advanced Research Project Agency's TICS. See Sam Black and Timothy Barnes, "Fiscal Year 2008 Defense Budget: Programs of Interest," Center for Defense Information; www.cdi.org/program/document.cfm?DocumentID=4130&StartRow=31&ListRows=10&appendURL=&Orderby=D.DateLastUpdated&ProgramID=6&from_page=index.cfm.
4. Derived from Congressional Budget Office, *The START Treaty and Beyond*, 135 (100 percent of total).
5. Calculated by adding MFPs 1, 2, and 11 (Strategic Forces, General Purpose Forces, and Special Operations Forces; \$272,984), dividing MFP 1 by this total (0.0368400987) and multiplying all other MFPs by this amount (\$10,900.211). U.S. Department of Defense, "National Defense Budget Estimates for FY2009," budget estimates, September 2008, 73; www.defenselink.mil/comptroller/defbudget/fy2009/FY09Greenbook/greenbook_2009_updated.pdf.
6. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates," budget estimates, February 2008, vol. 1; www.saffm.hq.af.mil/shared/media/document/AFD-080204-070.pdf.
7. B-1s, B-2s, and B-52s are included but not disaggregated. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates."
8. ICBMs (and helicopter support), ALCM, ACM, and Airborne Laser are included but not disaggregated. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates."
9. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates."
10. Ibid.

TABLE 8 CONTINUED

Combating Weapons of Mass Destruction (CWMD)	
Joint Intelligence Preparation of the Operational Environment (JIPOE)*	17.118 ¹¹
Arms Control*	39.144 ¹²
Defense Environmental Restoration Program*	42.038 ¹³
RDT&E	
Space Survivability and Surveillance-Nuclear Test Seismic Research*	6.777 ¹⁴
ICBM demonstration/validation	31.121 ¹⁵
Nuclear Weapons Support*	20.191 ¹⁶
B-2 Advanced Technology Bomber	295.945 ¹⁷
Space-Based Infrared System High EMD*	583.317 ¹⁸
E-4B National Airborne Operations Center Modernization*	19.406 ¹⁹
Minimum Essential Emergency Communications Environment (MEECN)	
System Improvements	58.533 ²⁰
Global Combat Support System (GCCS)	11.756 ²¹
WWMCCS/Global Command and Control System	4.471 ²²
NUDET Detection System (Space)*	38.279 ²³
KC-135 Aging Aircraft Program	8.710 ²⁴
PROCUREMENT	
Ballistic Missile Equipment Replacement	18.370 ²⁵
Minuteman Modifications	512.400 ²⁶
ALCM and Minuteman initial spares	4.368 ²⁷
ALCM and Minuteman replenishment spares	18.583 ²⁸

11. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates."

12. Includes START, INF, CFE, CWC, and Open Skies. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates," 809–810.

13. Nuclear bases not identified or disaggregated. No other environmental restoration costs identified. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates," budget estimates, February 2008, vol. 2; www.saffm.hq.af.mil/shared/media/document/AFD-080204-071.pdf.

14. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates: Research, Development, Test and Evaluation (RDT&E), Descriptive Summaries, Budget Activities 1-3," budget estimates, February 2008, vol. 1: 203, 205, 208, www.saffm.hq.af.mil/shared/media/document/AFD-080130-059.pdf.

15. \$65.629 million requested for FY 2009. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates: Research, Development, Test and Evaluation (RDT&E), Descriptive Summaries, Budget Activities 4-6," budget estimates, February 2008, vol. 2; www.saffm.hq.af.mil/shared/media/document/AFD-080130-061.pdf.

16. Ibid.

17. Ibid.

18. Ibid.

19. \$4.069 million requested for FY 2009. U.S. Department of the Air Force, "Fiscal Year (FY) 2009 Budget Estimates: Research, Development, Test and Evaluation (RDT&E), Descriptive Summaries, Budget Activity 7," budget estimates, February 2008, vol. 3; www.saffm.hq.af.mil/shared/media/document/AFD-080130-062.pdf.

20. "MEECN systems provide assured communications connectivity between the President and the strategic deterrent forces in stressed environments." Ibid.

21. \$4.320 million requested in FY 2009. Ibid.

22. Ibid.

23. This can also support nuclear force operations. Ibid.

24. Ibid.

25. For Minuteman items and transporter tractor trailer. United States, Department of the Air Force. "FY 2009 Budget Estimates: Missile Procurement, Air Force," committee staff procurement backup book, February 2008; www.saffm.hq.af.mil/shared/media/document/AFD-080204-085.pdf.

26. Ibid.

27. Ibid.

28. Ibid.

TABLE 8 CONTINUED

Defense Meteorological Satellite Program	125.839 ²⁹
Vandenberg AFB launch base support*	3.149 ³⁰
Space-Based Infrared System High Advance Procurement*	395.310 ³¹
Global Hawk	580.892 ³²
Predator UAV	276.120 ³³
B-2A Interim Contractor Support	34.545 ³⁴
B-2 modifications	212.142 ³⁵
B-52 modifications	33.100 ³⁶
E-4B (National Airborne Operations Center) modifications*	19.610 ³⁷
Global Hawk modifications	25.800 ³⁸
Predator modifications	74.200 ³⁹
CONSTRUCTION	
Construction at Minot Air Force Base*	90.424 ⁴⁰
Army	
RDT&E	
Patriot/MEADS Combined Aggregate Program*	369.786 ⁴¹
Nuclear Arms Control Monitoring and Sensor Network*	7.253 ⁴²
Army Kwajalein Atoll	180.052 ⁴³
Support for Air Force and Navy ballistic missile tests (est.)*	81.023
Support for Missile Defense Agency demonstration/validation tests (est.)*	81.023
OPERATIONS AND MAINTENANCE	
Army National Guard	
Domestic Preparedness Weapons of Mass Destruction*	85.720 ⁴⁴

29. Ibid.

30. Ibid.

31. \$1,718.043 million requested in FY 2009. Ibid.

32. U.S. Department of the Air Force, "FY 2009 Budget Estimates: Aircraft Procurement, Air Force," committee staff procurement backup book, February 2008, vol. 1; www.saffm.hq.af.mil/shared/media/document/AFD-080204-081.pdf.

33. \$676.140 million was allocated in FY 2007. Ibid.

34. Ibid.

35. U.S. Department of the Air Force, "FY 2009 Budget Estimates: Aircraft Procurement, Air Force," committee staff procurement backup book, February 2008, vol. 2; www.saffm.hq.af.mil/shared/media/document/AFD-080204-083.pdf.

36. Ibid.

37. \$600,000 for the Nuclear Planning and Execution System (NPES) technical refresh project. Ibid.

38. Ibid.

39. Ibid.

40. This is the FY 2008 request (FY 2009 budget does not provide FY 2008 data). U.S. Department of the Air Force, "Fiscal Year (FY) 2008/2009 Budget Estimates: Program 2008," military construction program, February 2007, 129–132; www.saffm.hq.af.mil/shared/media/document/AFD-070209-046.pdf.

41. U.S. Department of the Army, "Supporting Data FY 2009 Budget Estimate: Descriptive Summaries of the Research, Development, Test and Evaluation, Army Appropriations, Budget Activities 4 & 5, February 2008, vol. 2, 898–906; www.asafm.army.mil/budget/fybm/FY09/rforms/vol2.pdf.

42. Ibid., 907–913.

43. U.S. Department of the Army, "Supporting Data FY 2009 Budget Estimate: Descriptive Summaries of the Research, Development, Test and Evaluation, Army Appropriations, Budget Activities 4 & 5, February 2008, vol. 3, 21–22; www.asafm.army.mil/budget/fybm/FY09/rforms/vol3.pdf.

44. U.S. Department of the Army, "Fiscal Year (FY) 2009 Budget Estimates: Operation & Maintenance, Army National Guard," justification book, February 2008, vol. 1, 140–141; www.asafm.army.mil/budget/fybm/FY09/omng-v1.pdf.

TABLE 8 CONTINUED

Navy	
PERSONNEL	
Nuclear Officer Incentive Pay*	9.271 ⁴⁵
Nuclear Accession Bonus*	0.422 ⁴⁶
OPERATIONS AND MAINTENANCE	
Nuclear Material Consumption	1.517 ⁴⁷
Intermediate Level Maintenance (includes Trident Refit Facilities and Naval Submarine Support Facility New London)	737.938 ⁴⁸
Nuclear Propulsion Technical Logistics and Operating Reactor Plant Technology	150.319 ⁴⁹
Radiation Control and Health	1.790 ⁵⁰
Radiation Detection, Indication, and Computation	7.642 ⁵¹
Fleet Ballistic Missile Operations	969.413 ⁵²
Portsmouth Naval Shipyard (overhaul, repair, modernization, refueling of Los Angeles-class SSNs)	592.326 ⁵³
PROCUREMENT	
Trident II modifications and missile industrial facilities	1,048.200 ⁵⁴
SHIPBUILDING & CONVERSION	
SSBN Engineered Refueling Overhaul	238.700 ⁵⁵
Trident SSBN Ordnance (conversion from C4 to D5 SLBMs)	40.217 ⁵⁶
SSBN Engineered Refueling Overhaul Advance Procurement	42.500 ⁵⁷
OPERATIONS & MAINTENANCE	
Strategic Platform Support Equipment*	9.993 ⁵⁸

45. For select officers who complete nuclear power training or operate naval reactors (up to \$25,000 each). Figure is 16 percent of total (\$57.941 million). U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Military Personnel, Navy," justification of estimates, February 2008, 18; www.finance.hq.navy.mil/FMB/09PRES/MPN_Book.pdf.

46. Up to \$20,000 for individuals accepted into nuclear power training. Figure is 16 percent of total (\$2.640). Ibid.

47. Figure is 16 percent of total (\$9.479 million). U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Operation & Maintenance, Navy."

48. Covers personnel on tenders, repair ships, aircraft carriers in refit, ballistic missile submarines (SSBNs) in refit, and attack submarines (SSNs) and support vessels at New London, Connecticut. Ibid.

49. 67 percent of total (\$223.268 million) per formula for DOE naval reactors. Ibid.

50. 67 percent of total (\$2.658 million) per formula for DOE naval reactors. Ibid.

51. 67 percent of total (\$11.351 million) per formula for DOE naval reactors. Ibid.

52. For FY 2009, includes \$10.3 million for air support of the convoy route at Bangor and Kings Bay. Ibid.

53. United States, Department of the Navy. "Fiscal Year (FY) 2009 Budget Estimates: Operations & Maintenance, Navy Data Book," justification of estimates, February 2008, vol. 2, 18; www.finance.hq.navy.mil/FMB/09PRES/OMN_Vol2_book.pdf.

54. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Other Procurement, Navy Budget Activity 1," justification of estimates, February 2008, N-3; www.finance.hq.navy.mil/FMB/09PRES/WPN_BOOK.pdf.

55. Includes advance procurement beginning in FY 2005. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Shipbuilding and Conversion, Navy," justification of estimates, February 2008, 8-1; www.finance.hq.navy.mil/FMB/09PRES/SCN_BOOK.pdf.

56. Program may be counted in MFP 1. Ibid., 8-5.

57. Ibid., 9-1.

58. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Other Procurement, Navy Budget Activity 1," justification of estimates, February 2008; www.finance.hq.navy.mil/fmb/09pres/OPN_BA1_BOOK.pdf.

TABLE 8 CONTINUED

Escort vessels for Trident SSBNs*	65.300 ⁵⁹
Surveillance Towed Array Sensor System (SURTASS)	6.300 ⁶⁰
Strategic Platform Support Equipment	1.600 ⁶¹
Strategic Missile Systems Equipment (Trident II/D5 life extension)	136.900 ⁶²
Operating Forces Support Equipment (floating pier and wharf for Trident submarine bases)	3.790 ⁶³
Trident submarine base security equipment (WRAS and WFLAS)	52.772 ⁶⁴
RDT&E	
WMD detection (fissile materials and weapons)*	6.694 ⁶⁵
Stoppage of large surface vessels at sea (suspected of carrying WMD)*	7.147 ⁶⁶
Joint Service Explosive Ordnance Development (respond to IND and WMD incidents)*	10.165 ⁶⁷
Submarine Integrated Antenna System Project (SSN/SSBN/SSGN)	34.009 ⁶⁸
New Design SSN (Virginia class)	3,364.081 ⁶⁹
Family of Incident Response Systems*	1.833 ⁷⁰
Strategic Submarine and Weapon System Support	67.758 ⁷¹
Navy/Air Force Reentry Systems Application Program	79.253 ⁷²
Enhanced Special Weapons	5.816 ⁷³
Reliable Replacement Warhead*	14.455 ⁷⁴
Fleet Communications (includes positive control and EAM dissemination to SSBNs)	23.582 ⁷⁵

59. Program is estimated to cost \$475.3 million by completion. Ibid.

60. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Other Procurement, Navy Budget Activity 2," justification of estimates, February 2008; www.finance.hq.navy.mil/fmb/09pres/OPN_BA2_BOOK.pdf.

61. Ibid.

62. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Other Procurement, Navy Budget Activity 4," justification of estimates, February 2008; www.finance.hq.navy.mil/fmb/09pres/OPN_BA4_BOOK.pdf.

63. U.S. Department of the Navy, "Fiscal Year (FY) 2009 Budget Estimates: Other Procurement, Navy Budget Activity 5-7," justification of estimates, February 2008; www.finance.hq.navy.mil/fmb/09pres/OPN_BA5-7_BOOK.pdf.

64. This is for both Kings Bay and Bangor submarine bases. Ibid.

65. U.S. Department of the Navy, "FY 2009 Budget Estimate: Research, Development, Test and Evaluation, Navy Budget Activities 1-3," justification of estimates, February 2008; www.finance.hq.navy.mil/FMB/09PRES/RDTEN_BA1-3_BOOK.pdf.

66. Ibid.

67. U.S. Department of the Navy, "FY 2009 Budget Estimate: Research, Development, Test and Evaluation, Navy Budget Activity 5," justification of estimates, February 2008; www.finance.hq.navy.mil/FMB/09PRES/RDTEN_BA5_book.pdf.

68. Ibid.

69. U.S. Department of the Navy.

70. \$4.039 million requested in FY 2009. U.S. Department of the Navy, "FY 2009 Budget Estimate: Research, Development, Test and Evaluation, Navy Budget Activity 6," justification of estimates, February 2008; www.finance.hq.navy.mil/FMB/09PRES/RDTEN_BA6_book.pdf.

71. U.S. Department of the Navy, "FY 2009 Budget Estimate: Research, Development, Test and Evaluation, Navy Budget Activity 7," justification of estimates, February 2008; www.finance.hq.navy.mil/FMB/09PRES/RDTEN_BA7_book.pdf.

72. Ibid.

73. Was \$41.863 million in FY 2007. Ibid.

74. \$23.346 million requested for FY 2009. Ibid.

75. Ibid.

TABLE 8 CONTINUED

Integrated Undersea Surveillance System	31.138 ⁷⁶
Satellite Communications (includes SSBNs, strategic defense, theater defense, space, and intelligence operations)	724.771 ⁷⁷
COOPERATIVE THREAT REDUCTION (CTR)	261.387 ⁷⁸
Strategic Offensive Arms Elimination-Russia	90.652
Strategic Offensive Arms Elimination-Ukraine	2.233
Nuclear Weapons Storage Security-Russia	45.516
Nuclear Weapons Transportation Security-Russia	37.700
WMD Proliferation Prevention-FSU	47.956
WMD Proliferation non-FSU/New Initiatives	10.000 ⁷⁹
Defense and Military Contacts	8.000
Other/Administrative Support	19.300 ⁸⁰
Missile Defense Agency	8,655.300 ⁸¹
Block 1—Defend U.S. from limited long-range DPRK attack	1,534.500
Block 2—Defend allies and U.S. forces from short- to medium-range threats in one region	1,408.200
Block 3—Expand U.S. defense to cover limited long-range Iran attack	650.000
Block 4—Defend allies and forces in Europe from limited Iran attack; expand U.S. defenses	243.400
Block 5—Defend allies and U.S. forces from short- to medium-range threats in two regions	653.700
Capability Development	2,054.000
Sustainment	736.000 ⁸²
Mission Area Investment	983.700 ⁸³
MDA Operations	391.800 ⁸⁴

76. Ibid.

77. Ibid.

78. Defense Threat Reduction Agency, "Fiscal Year (FY) 2009 Budget Estimates, Former Soviet Union Threat Reduction—Cooperative Threat Reduction Program," February 2008; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/01_Operation_and_Maintenance/O_M_VOL_1_PARTS/x%200134%20CTR%20FY%2009%20PB%20OP-5.pdf. See also Raphael Della Ratta, "Preliminary Analysis of the U.S. Department of Defense's Fiscal Year 2009 Cooperative Threat Reduction Request," Partnership for Global Security, March 26, 2008; www.partnershipforglobalsecurity.org/PDFFrameset.asp?PDF=ctr_2009_budget_request.pdf.

79. Some non-nuclear programs included.

80. Some non-nuclear programs included.

81. U.S. Department of Defense, "Missile Defense Agency: Fiscal Year 2009 (FY09) Budget Estimates," overview, January 23, 2008, 36; www.mda.mil/mdalink/pdf/budgetfy09.pdf. See also the MDA's detailed budget justification documents, available under the "RDT and E" link at Office of the Under Secretary of Defense (Comptroller) website, www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/index.html.

82. \$257.7 million for theater (exclusive of "Future Capability Development," "Technology," "BMDS Special Interest," "Regarding Trench," and "Special Programs.")

83. At least \$48.9 million for theater (exclusive of "Sensors," "C2BMC," "Test and Targets," and "BMDS Annualized Sustainment.")

84. Impossible to disaggregate given level of budget detail.

TABLE 8 CONTINUED

Defense Threat Reduction Agency	773.872 ⁸⁵
OPERATIONS AND MAINTENANCE	313.782
Arms control inspections and technology	63.581 ⁸⁶
WMD combat support and operations	82.940 ⁸⁷
Support to STRATCOM for Center for Combating WMD	27.631 ⁸⁸
DTRA core operational support activities	133.750 ⁸⁹
Defense Threat Reduction University	5.880
PROCUREMENT	4.593
Administration and service-wide activities	4.593 ⁹⁰
RDT&E	455.497 ⁹¹
DTRA basic research initiative	10.831
WMD defeat technologies	211.325
Proliferation, prevention, and defeat	215.609
WMD defeat capabilities	15.296
Small Business Innovation Research	2.436
Defense Advanced Research Projects Agency (DARPA)	
High Productivity Computing Systems	47.243 ⁹²
Novel Sensors for Force Protection	7.071 ⁹³
Sleight of HAND (High Altitude Nuclear Detonations)	12.710 ⁹⁴

85. Total reduced by an estimated \$15.756 million to resolve some 1,300 Nuclear Test Personnel Review cases. U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2008/FY 2009 Budget Estimates," budget estimates, February 2007, 532-533; www.defenselink.mil/comptroller/defbudget/fy2008/budget_justification/pdfs/operation/O_M_VOL_1_PARTS/19_DTRA.pdf.

86. Excludes \$11.440 million in non-nuclear programs (reflected in O&M total). U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2009 Budget Estimates," budget estimates, February 2008, 477-484; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/01_Operation_and_Maintenance/O_M_VOL_1_PARTS/DTRA%20OP-5%20FY%202009%20PB.pdf.

87. Total reduced by an estimated \$15.756 million to resolve some 1,300 Nuclear Test Personnel Review cases. U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2008/FY 2009 Budget Estimates," 532-533.

88. Includes chemical, biological, radiological, and nuclear weapons, and high explosives.

89. Total is split between nuclear forces and nuclear threat reduction (prevention) categories.

90. U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2009 Budget Estimates: Procurement, Defense-wide," budget estimates, February 2008, 3; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/02_Procurement/Vol_1_Other_Defense_Agencies/DTRA_PDWPB09.pdf.

91. U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2009 Budget Estimates: Research, Development, Test and Evaluation, Defense-Wide," budget estimates, February 2008, 2; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/03_RDT_and_EV/Vol_5_Other_Defense_Agencies/DTRA%20PB09%20RDTE.pdf.

92. Not counted due to inability to estimate nuclear weapons-related costs. U.S. Department of Defense, "Fiscal Year 2009 Budget Estimates: Research, Development, Test, and Evaluation Defense Wide," budget estimates, February 2008, vol. 1: 44-45; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/03_RDT_and_EV/Vol_1_DARPA/DARPA%20PB09%20RDTE%20Part%201.pdf.

93. Not counted due to inability to estimate nuclear weapons-related costs. Ibid, 131-132.

94. U.S. Department of Defense, "Fiscal Year (FY) 2009 Budget Estimates: Research, Development, Test, and Evaluation Defense-Wide," budget estimates, February 2008, vol. 2: 316-317; www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/03_RDT_and_EV/Vol_1_DARPA/DARPA%20PB09%20RDTE%20Part%202.pdf.

TABLE 8 CONTINUED

Total	33,897.835
Total Department of Defense Budget	480,000.000⁹⁵
Percentage nuclear weapons-related	7.062%
Nuclear forces and operational support	22,495.652
Deferred environmental and health costs	1,069.007 ⁹⁶
Environmental management and cleanup	1,053.251 ⁹⁷
Victim compensation (Nuclear Test Personnel Review)	15.756 ⁹⁸
Missile defense	9,187.509
National missile defense	4,210.000
Theater missile defense	2,701.686
National and theater missile defense	2,275.823 ⁹⁹
Nuclear threat reduction	982.422
Prevention/securing	724.503
WMD detection (fissile materials and weapons)	6.694
Stoppage of large surface vessels at sea (suspected of carrying WMD)	7.147
Nuclear Weapons Storage Security-Russia	45.516
Nuclear Weapons Transportation Security-Russia	37.700
WMD Proliferation Prevention-FSU	47.986
Defense and Military Contacts	8.000
Other/Administrative Support	19.300
Support to STRATCOM for Center for Combating WMD	27.631
Administration and service-wide activities	4.593
DTRA basic research initiative	10.831
WMD defeat technologies	211.325
Proliferation, prevention, and defeat	215.609
WMD defeat capabilities	15.296
Elimination	92.885
Strategic Offensive Arms Elimination-Russia	90.652
Strategic Offensive Arms Elimination-Ukraine	2.233
Nonproliferation	165.034
Arms Control	39.144
Space Survivability and Surveillance-Nuclear Test Seismic Research	6.777

95. Includes emergency supplemental costs for operations in Iraq and Afghanistan.

96. Estimate (based on *Atom Audit* calculation that 29 percent of military spending historically has been for nuclear weapons).

97. Figure is 29 percent of estimated 2008 Defense Environmental Programs budget for environmental restoration, Base Restoration and Closure, and compliance (\$3,631.9 million). U.S. Department of Defense, "Appendix B: Environmental Management Budget Overview," Fiscal Year 2007 Annual Report to Congress; www.denix.osd.mil/portal/page/portal/content/environment/ARC/FY2007/04_FY07DEPARC_App_B_EM_Budget_final.pdf.

98. Included in DTRA's "WMD Operations and Support" budget (see line 138). Estimate of the cost to resolve some 1,300 Nuclear Test Personnel Review cases. U.S. Defense Threat Reduction Agency, "Fiscal Year (FY) 2008/FY 2009 Budget Estimates," 532–533.

99. This category includes portions of the Missile Defense Agency's capability development, sustainment, mission area investment, and MDA operations line items which apply to both national and theater missile defense programs and cannot be disaggregated.

TABLE 8 CONTINUED

NUDET Detection System (Space)	38.279
Nuclear Arms Control Monitoring and Sensor Network	7.253
WMD Proliferation non-FSU/New Initiatives	10.00
Arms control inspections and technology	63.581
Nuclear incident management	163.245
Emergency preparedness	115.548
Combating Weapons of Mass Destruction (CWMD) Joint Intelligence Preparation of the Operational Environment (JIPOE)	17.118
Domestic Preparedness Weapons of Mass Destruction	85.720
Sleight of HAND (High Altitude Nuclear Detonations)	12.710
Incident response	47.697
Weapons of Mass Destruction Threat Response	33.263
Joint Service Explosive Ordnance Development (respond to IND and WMD incidents)	10.165
Family of Incident Response Systems	1.833
Small Business Innovation Research	2.436

TABLE 9. *Department of Energy*

Program	FY 2008 Appropriations (millions of dollars)
NATIONAL NUCLEAR SECURITY ADMINISTRATION ¹⁰⁰	
Office of the Administrator	379.997 ¹⁰¹
Weapons Activities	6,297.466 ¹⁰²
Defense Programs	4,989.315 ¹⁰³
Directed Stockpile Work	1,266.577 ¹⁰⁴
<i>Weapons Dismantlement and Disposition</i>	134.675 ¹⁰⁵
Science Campaign	287.624 ¹⁰⁶
Engineering Campaign	169.548
Inertial Confinement Fusion and High Yield Campaign	470.206 ¹⁰⁷
Advanced Simulation and Computing Campaign	574.537
Pit Manufacturing and Certification Campaign	213.831 ¹⁰⁸
Readiness Campaign	158.088
Readiness in Technical Base and Facilities	1,637.381 ¹⁰⁹
Secure Transportation Asset	211.523
Nuclear Weapons Incident Response (includes NEST)	158.655 ¹¹⁰
Facilities and Infrastructure Recapitalization Program	179.991
Environmental Projects and Operations	8.592 ¹¹¹
Defense Nuclear Security	765.233 ¹¹²
Cyber Security	100.287 ¹¹³
Congressionally Directed Projects	47.232
Defense Nuclear Nonproliferation	1,657.996 ¹¹⁴

100. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," budget, February 2008, vol. 1, 24–443; www.cfo.doe.gov/budget/09budget/Content/Volumes/Volume1a.pdf.

101. Excludes congressionally directed projects.

102. Subcomponents do not match total due to use of \$86.514 in prior-year funds.

103. \$5,249.143 million requested for FY 2009.

104. \$1,675.715 million requested for FY 2009.

105. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 91.

106. \$323.070 million requested for FY 2009.

107. \$421.242 million requested for FY 2009.

108. No funds requested for FY 2009.

109. \$1,720.523 million requested for FY 2009.

110. \$221.936 million requested for FY 2009.

111. \$40.587 million requested for FY 2009.

112. Part of Safeguards and Security.

113. Part of Safeguards and Security.

114. \$1,247.048 million requested for FY 2009. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 451–542.

TABLE 9 CONTINUED

Nonproliferation and Verification Research and Development	387.196 ¹¹⁵
Proliferation Detection	224.445 ¹¹⁶
Nuclear Detonation Detection	132.484 ¹¹⁷
Supporting Activities	5.495
Construction	24.772
Nonproliferation and International Security	149.993 ¹¹⁸
Dismantlement and Transparency	45.700
Global Security Engagement and Cooperation	50.912
International Regimes and Agreements	44.444
Treaties and Agreements	3.879
International Emergency Management and Cooperation	5.049
International Nuclear Materials Protection and Cooperation	624.482 ¹¹⁹
Navy Complex	13.268
Strategic Rockets Forces/12th Main Directorate	121.912
Rosatom Weapons Complex	79.114
Civilian Nuclear Sites	54.188
Material Consolidation and Conversion	19.488
National Programs and Sustainability	69.632
Second Line of Defense Core Programs	266.880
Second Line of Defense Megaports Program	130.845
Elimination of Weapons-Grade Plutonium Production	179.940 ¹²⁰
Seversk activities	19.400
Zheleznogorsk activities	159.140
Crosscutting and technical support activities	1.400
Fissile Materials Disposition	66.235 ¹²¹
U.S. Plutonium Disposition	0.000 ¹²²
U.S. Uranium Disposition	66.235 ¹²³
Supporting Activities	0.000 ¹²⁴
Construction	0.000 ¹²⁵
Russian Surplus Fissile Materials Disposition	0.000
Global Threat Reduction Initiative	193.225 ¹²⁶
HEU Reactor Conversion	33.819
Nuclear and Radiological Material Removal	67.759 ¹²⁷

115. \$275.091 million requested for FY 2009. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 467–476.

116. \$50.000 million is for homeland security–related detection

117. Also used for Tactical Warning/Threat Assessment.

118. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 477–492.

119. \$429.694 million requested for FY 2009. *Ibid.*, 493–506.

120. \$141.299 million requested for FY 2009. Department of Energy, *Ibid.*, 507–515.

121. *Ibid.*, 517–525.

122. This was \$57.415 million in FY 2007.

123. This was \$86.898 million in FY 2007.

124. This was \$14.960 million in FY 2007.

125. This was \$310.789 million in FY 2007.

126. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 526–538.

127. \$116.621 million requested for FY 2009, including \$39.2 million for Russian-origin material, and \$16 million for international-origin material.

TABLE 9 CONTINUED

Russian Research Reactor Fuel Return (RRRFR)	38.896
U.S. Foreign Research Reactor Spent Nuclear Fuel (FRRSNF)	9.887
Emerging Threats and Gap Materials	5.466
U.S. Radiological Threat Reduction	13.510
Nuclear and Radiological Material Protection	91.647
Kazakhstan Spent Fuel	43.098
Global Research Reactor Security	3.557
International Radiological Threat Reduction (IRTR)	13.510
International Nuclear Fuel Bank	49.545 ¹²⁸
Congressionally Directed Projects	7.380 ¹²⁹

Naval Reactors	123.950 ¹³⁰
Operations and Maintenance	732.374 ¹³¹
Program Direction	32.403
Construction	9.909

ENVIRONMENTAL MANAGEMENT	
Defense Environmental Cleanup	5,349.325 ¹³²
Closure Sites	42.050
Hanford Site	886.498 ¹³³
Idaho National Laboratory	508.358 ¹³⁴
NNSA Sites	290.264 ¹³⁵
Oak Ridge	190.540 ¹³⁶
Office of River Protection	969.540
Savannah River Site	1,131.202 ¹³⁷
Waste Isolation Pilot Plant	234.585
Program Support	32.844
Program Direction	306.941
Safeguards and Security	259.332
Technology Development and Deployment	21.194
Congressionally Directed Projects	17.195
Uranium Enrichment Decontamination and Decommissioning Fund	622.162 ¹³⁸
Oak Ridge	282.181 ¹³⁹

128. No funds requested for FY 2009 or beyond. U.S. Department of Energy, "FY 2009 Congressional Budget Request: National Nuclear Security Administration, Office of the Administration, Weapons Activities, Defense Nuclear Nonproliferation, Naval Reactors," 539–540.

129. *Ibid.*, 541–542.

130. \$774.686 million is total for FY 2008. \$828.054 requested for FY 2009. *Ibid.*, 547.

131. Total figure is 16 percent of overall naval reactor budget (16 out of 101 reactors are for nuclear weapons–related missions).

132. \$5,298.365 million requested for FY 2009. U.S. Department of Energy, "FY 2009 Congressional Budget Request: Environmental Management, Defense Nuclear Waste Disposal and Nuclear Waste Disposal," budget, February 2008, 11; www.cfo.doe.gov/budget/09budget/Content/Volumes/Volume5.pdf.

133. \$851.787 million requested for FY 2009.

134. \$432.124 million requested for FY 2009.

135. \$245.084 million requested for FY 2009.

136. \$237.670 million requested for FY 2009.

137. \$1,206.425 million requested for FY 2009.

138. U.S. Department of Energy, "FY 2009 Congressional Budget Request: Environmental Management, Defense Nuclear Waste Disposal and Nuclear Waste Disposal," 11, 13.

139. \$184.230 million requested for FY 2009.

TABLE 9 CONTINUED

Paducah Gaseous Diffusion Plant	115.614
Portsmouth Gaseous Diffusion Plant	202.549
Uranium/Thorium Licensee Reimbursements	19.818
DEFENSE NUCLEAR WASTE DISPOSAL/OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT	
Defense Nuclear Waste Disposal	255.352 ¹⁴⁰
OTHER DEFENSE ACTIVITIES	
Health, Safety, and Security	424.471 ¹⁴¹
Health and Safety	60.457 ¹⁴²
Security	265.867 ¹⁴³
Nuclear Safeguards and Security	228.374 ¹⁴⁴
Security Investigations	37.493 ¹⁴⁵
Program Direction	99.137 ¹⁴⁶
Legacy Management	188.833 ¹⁴⁷
Nuclear Energy ¹⁴⁸	
Fuel Cycle Research and Facilities	
Advanced Fuel Cycle Initiative	179.353
Mixed Oxide Fuel Fabrication Facilities	278.789
Program Direction	35.835 ¹⁴⁹
Defense Related Administrative Support	98.104 ¹⁵⁰
(Nuclear forces and operational support, est.)	0.785
(Deferred environmental and health costs, est.)	85.841
(Nuclear threat reduction, est.)	11.478

140. Includes \$199.171 million for defense waste and 30 percent of repository-related costs (\$56.181 million). Ibid., 536.

141. Covers all DOE programs. U.S. Department of Energy, "FY 2009 Congressional Budget Request: Other Defense Activities, Departmental Administration, Inspector General, Loan Guarantee Program, Working Capital Fund, Energy Information Administration, Safeguards and Security Crosscut," budget, February 2008, 11; www.cfo.doe.gov/budget/09budget/Content/Volumes/Volume2.pdf.

142. Subcomponents do not match total due to use of a \$990,000 prior-year balance. Ibid., 29.

143. Ibid.

144. Ibid., 53, 412–421; \$1,267.451 million spent on field security.

145. Ibid., 53.

146. Ibid., 67.

147. \$101.065 million was for Rocky Flats Site. Total includes program direction. The largest expense (\$127.338 million) is for pension and benefit continuity. Ibid., 79.

148. Ibid., 105–109.

149. 44 percent of Nuclear Energy total. U.S. Department of Energy, "FY 2009 Congressional Budget Request: Other Defense Activities, Departmental Administration, Inspector General, Loan Guarantee Program, Working Capital Fund, Energy Information Administration, Safeguards and Security Crosscut," 107.

150. "This budget offsets Departmental Administration administrative work that supports the following appropriations: Defense Environmental Cleanup, Defense Nuclear Waste Disposal, and Other Defense Activities. These functions do not duplicate services provided within the Office of the Administrator for the National Nuclear Security Administrative Program." Ibid., 145.

TABLE 9 CONTINUED

Total	15,892.623
Total Department of Energy Budget	23,884.824
Percentage nuclear weapons-related	66.539%
Nuclear forces and operational support	6,569.325 ¹⁵¹
Deferred environmental and health costs	6,501.513
Environmental management and cleanup	6,242.727
Defense nuclear waste disposal	258.786
Nuclear threat reduction	2,663.130
Prevention/Securing	1,087.262
International Nuclear Materials Protection and Cooperation	624.482
Nuclear and Radiological Material Protection	91.647
Security	265.867
Program Direction	99.137
Defense Related Administrative Support (est.)	6.129
Elimination	947.935
Weapons Dismantlement and Disposition	134.675
Elimination of Weapons-Grade Plutonium Production	179.940
Fissile Materials Disposition	66.235
Nuclear and Radiological Material Removal	67.759
Advanced Fuel Cycle Initiative	179.353
Mixed Oxide Fuel Fabrication Facilities	278.789
Program Direction	35.835
Defense Related Administrative Support (est.)	5.349
Nonproliferation	627.933
Nonproliferation and Verification Research and Development	387.196
Nonproliferation and International Security	149.993
HEU Reactor Conversion	33.819
International Nuclear Fuel Bank	49.545
Congressionally Directed Projects	7.380
Nuclear incident management	158.655
Incident response	158.655
Nuclear Weapons Incident Response (includes NEST)	158.655

151. Includes reduction of \$86.514 million to reflect NNSA use of prior-year balance.

TABLE 10. *Defense Nuclear Facilities Safety Board*

Program	FY 2008 Appropriations (millions of dollars)
Annual budget	23.872 ¹⁵²
Total Defense Nuclear Facilities Safety Board Budget	23.872
Percentage nuclear weapons–related	100.000%
Nuclear forces and operational support	11.936
Deferred environmental and health costs	11.936

152. Figure is outlays; budget authority is \$21.909 million. U.S. Defense Nuclear Facilities Safety Board, "FY 2009 Budget Request to Congress," budget, February 2008, ii, www.dnfsb.gov/budget/budget_fy2009.pdf.

TABLE 11. *Department of Homeland Security*

Program	FY 2008 Appropriations (millions of dollars)
DOMESTIC NUCLEAR DETECTION OFFICE¹⁵³	
Management and Administration	31.500
Research, Development, and Operations	308.500 ¹⁵⁴
National Technical Nuclear Forensics Center	15.000
Systems Acquisition	129.750
Radiation Portal Monitor Program	90.000 ¹⁵⁵
Securing the Cities	30.000 ¹⁵⁶
Human Portal Radiation Detection Systems Program	9.750
Total Domestic Nuclear Detection Office	469.750¹⁵⁷
SCIENCE AND TECHNOLOGY DIRECTORATE	
Laboratory Facilities	15.000 ¹⁵⁸
Pacific Northwest National Laboratory, Area 300	15.000 ¹⁵⁹
CUSTOMS AND BORDER PROTECTION	
International Cargo Screening (formerly Container Security Initiative)	156.130 ¹⁶⁰
FEDERAL EMERGENCY MANAGEMENT AGENCY	
Mt. Weather Capital Improvement Plan (Mt. Weather Emergency Operations Center)	10.413 ¹⁶¹
Radiological Emergency Preparedness Program	24.922 ¹⁶²
National Continuity Programs	215.552 ¹⁶³
Total	906.767
Total Department of Homeland Security Budget	52,915.102
Percentage nuclear weapons-related	1.714%

153. U.S. Department of Homeland Security, "FY 2009 Explanation of Changes: General Provisions," 37, 2591-2727; www.dhs.gov/xlibrary/assets/budget_fy2009.pdf.

154. Excludes National Technical Nuclear Forensics Center budget.

155. Requested \$157.700 million for FY 2009.

156. This was \$162.000 million in FY 2007. Requested \$20.000 million in FY 2009.

157. This was \$615.968 million in FY 2007. Requested \$563.800 million for FY 2009.

158. Total budget is \$103.814 million. Utilizes DOE national laboratories and other laboratories. Primary customers are the U.S. Department of Agriculture, the Transportation Security Administration, and the FBI.

159. Works on radiological detection and analysis, dosimetry for standards, and information analytics. Department of Homeland Security, "FY 2009 Explanation of Changes: General Provisions," 2489 (S&T R&D 93).

160. *Ibid.*, 77-80.

161. *Ibid.*, 1161-1162.

162. This activity focuses on emergency planning zones for commercial power reactors. *Ibid.*, 1267-1285.

163. This was \$157.770 million in FY 2007. Although not exclusively nuclear related, the nuclear threat drives these efforts. *Ibid.*, 1104-1105, 1520-1521, 1535.

TABLE 11 CONTINUED

Nuclear threat reduction	625.880
Prevention/securing	625.880
Management and Administration	31.500
Research, Development, and Operations	308.500
Systems Acquisition	129.750
International Cargo Screening (formerly Container Security Initiative)	156.130
Nuclear incident management	280.887
Emergency preparedness	250.887
Mt. Weather Capital Improvement Plan (Mt. Weather Emergency Operations Center)	10.413
Radiological Emergency Preparedness Program	24.922
National Continuity Programs	215.552
Incident response	30.000
National Technical Nuclear Forensics Center	15.000
Pacific Northwest National Laboratory, Area 300	15.000

TABLE 12. *Department of State*

Program	FY 2008 Appropriations (est.)¹⁶⁴ (millions of dollars)
DIPLOMATIC AND CONSULAR PROGRAMS	
Under Secretary for Arms Control	2.102 ¹⁶⁵
Bureau of International Security and Nonproliferation	40.286 ¹⁶⁶
Bureau of Verification, Compliance, and Implementation	17.843 ¹⁶⁷
Office of the Legal Adviser	1.489 ¹⁶⁸
Bureau of Intelligence and Research	5.618 ¹⁶⁹
INTERNATIONAL ORGANIZATIONS	
International Atomic Energy Agency (IAEA)	62.613 ¹⁷⁰
INTERNATIONAL AFFAIRS (FUNCTION 150)	
Nonproliferation, Antiterrorism, Demining, and Related Programs	
Nonproliferation and Disarmament Fund ¹⁷¹	11.242
Export Control and Related Border Security Assistance	15.209 ¹⁷²
Global Threat Reduction	28.465 ¹⁷³
International Atomic Energy Agency Voluntary Contribution	33.153 ¹⁷⁴
Comprehensive Nuclear-Test-Ban Treaty International Monitoring System	23.806 ¹⁷⁵
Weapons of Mass Destruction Terrorism	0.000 ¹⁷⁶
Total	241.826
Total State Department Budget (includes \$29,093.738 for International Affairs)	39,845.95¹⁷⁷
Nuclear threat reduction	241.826
Prevention/securing	20.827

164. All figures are State Department estimates, not appropriations.

165. U.S. Department of State, "Congressional Budget Justification: Fiscal Year 2009," budget justification, 106, www.state.gov/documents/organization/100326.pdf.

166. Excludes several non-nuclear line items. *Ibid.*, 117, 121–123.

167. Excludes several non-nuclear line items. *Ibid.*, 125, 134.

168. Budget for Nonproliferation and Verification only. *Ibid.*, 162.

169. Figure is 10 percent of total budget (\$56.175 million). *Ibid.*, 173, 178–181.

170. Figure is 64.9 percent of total budget (\$96.476 million); 64.9 percent is the approximate proportion of the 2008 IAEA budget allocated to safeguards (verification) and policy, management, and administration.

171. Figure is one-third of total budget (\$33.725 million). U.S. Department of State, "Summary and Highlights: International Affairs Function 50," general summary, 82; www.state.gov/documents/organization/100014.pdf.

172. Figure is one-third of total budget (\$45.627 million). *Ibid.*, 82.

173. Figure is half of total budget (\$56.930 million). *Ibid.*, 82.

174. Figure is 64.9 percent of total budget (\$51.083 million); 64.9 percent is the approximate percentage of the 2008 IAEA budget allocated to safeguards (verification) and policy, management, and administration. *Ibid.*, 82.

175. \$13.5 million expended in FY 2007. *Ibid.*, 82.

176. \$5 million requested for FY 2009. *Ibid.*

177. The U.S. State Department's expenditures alone are \$10,752,214. Department of State, "Congressional Budget Justification: Fiscal Year 2009," 7; U.S. Department of State, "Summary and Highlights: International Affairs Function 50," 1–4.

TABLE 12 CONTINUED

Bureau of Intelligence and Research	5.618
Export Control and Related Border Security Assistance	15.209
Elimination	28.465
Global Threat Reduction	28.465
Nonproliferation	192.534
Under Secretary for Arms Control	2.102
Bureau of International Security and Nonproliferation	40.286
Bureau of Verification, Compliance, and Implementation	17.843
Office of the Legal Adviser	1.489
International Atomic Energy Agency	62.613
Nonproliferation and Disarmament Fund	11.242
International Atomic Energy Agency Voluntary Contribution	33.153
Comprehensive Nuclear-Test-Ban Treaty International Monitoring System	23.806

TABLE 13. *Department of Justice*

Program	FY 2008 Appropriations (millions of dollars)
FEDERAL BUREAU OF INVESTIGATION	
National Security Branch	568.102 ¹⁷⁸
Counterterrorism Division	551.850 ¹⁷⁹
Weapons of Mass Destruction Directorate	16.252 ¹⁸⁰
Science and Technology Branch ¹⁸¹	
Radiation Exposure Compensation Program (RECP) Trust Fund	
RECP administrative expenses	40.000 ¹⁸²
	3.400 ¹⁸³
Total	611.502
Total FBI Budget	6,657.689¹⁸⁴
Total Department of Justice Budget	24,178.002¹⁸⁵
Percentage nuclear weapons-related (FBI)	8.533%
Deferred environmental and health costs	
Victim compensation	43.400
Victim compensation	43.400
Nuclear threat reduction	568.102
Prevention/securing	568.102
Counterterrorism Division	551.850
Weapons of Mass Destruction Directorate	16.252

178. Estimated amount attributable to nuclear weapons.

179. Figure is one-fifth of total budget (\$2,759.251 million). U.S. Department of Justice, "FY 2009 Justification: Federal Bureau of Investigation," budget justification, 4-15; www.justice.gov/jmd/2009justification/pdf/fy09-fbi.pdf.

180. Figure is one-third of total budget (\$48.756 million). *Ibid.*, 6-14, 6-15.

181. Cannot locate budget.

182. Does not cover administrative costs. U.S. Department of Justice, "FY 2009 Justification: Federal Bureau of Investigation"; U.S. Department of Justice, "FY 2009 Request Compared with FY 2007 Actual Obligations and FY 2008 Enacted," comparative chart, 2, www.justice.gov/jmd/2009summary/pdf/estimate-comparison.pdf; U.S. Department of Justice, Radiation Exposure Compensation Program page; www.usdoj.gov:80/civil/torts/const/reca/index.htm.

183. Figure is for FY 2007. U.S. Department of Justice, "Civil Division: FY 2009 Performance Budget," congressional submission, February 2008, 24; www.justice.gov/jmd/2009justification/pdf/fy09-civ.pdf.

184. U.S. Department of Justice, "FY 2009 President's Budget," justification; www.justice.gov/jmd/2009justification/office/fy09-presidents-budget.xls.

185. U.S. Department of Justice, "FY 2009 Request Compared with FY 2007 Actual Obligations and FY 2008 Enacted."

TABLE 14. *Department of Commerce*

Program	FY 2008 Appropriations (millions of dollars)
BUREAU OF INDUSTRY AND SECURITY	
Counter-Proliferation Initiative	11.760 ¹⁸⁶
Total Department of Commerce Budget	7,606.730¹⁸⁷
Nuclear threat reduction	
Nonproliferation	11.760
Counter-Proliferation Initiative	11.760

186. Figure is one-third of FY 2009 request (\$35.280 million); FY 2008 figure unavailable. U.S. Department of Commerce. "Bureau of Industry and Security: FY 2009 President's Submission," budget estimates, BIS-51; www.osec.doc.gov/bmi/budget/09CBJ/BIS%20FY%202009%20Congressional%20Justification.pdf.

187. Amount is budget authority (outlays are \$8,156.478 million).

TABLE 15. *Department of Labor*

Program	FY 2008 Appropriations (millions of dollars)
ENERGY EMPLOYEES OCCUPATIONAL ILLNESS COMPENSATION PROGRAM ACT (EEOICPA)	581.980 ¹⁸⁸
Total Department of Labor Budget	49,798.246
Deferred environmental and health costs	581.980
Victim compensation	581.980

188. Includes \$49.387 million in program expenses and an estimated \$532,593,264 in compensation awards; see the Department of Health and Human Services table for additional program expenses. U.S. Department of Labor, "Employment Standards Administration: Energy Employees Occupational Illness Compensation Program Act," budget, 5–6, 17; www.dol.gov/dol/budget/2009/PDF/CBJ-2009-V2-07.pdf. See also U.S. Department of Justice, Radiation Exposure Compensation Program home: Office of the President, "Detailed Information on the Energy Employees Occupational Illness Compensation Program Assessment," program summary, September 6, 2008, www.whitehouse.gov/omb/expectmore/detail/10009004.2007.html; this site says that the FY 2008 EEOICPA budget is \$1.109 billion.

TABLE 16. *Department of Health and Human Services*

Program	FY 2008 Appropriations (millions of dollars)
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE OPERATIONS	632.703 ¹⁸⁹
(Estimated amount for nuclear/radiological terrorism)	63.270 ¹⁹⁰
CENTERS FOR DISEASE CONTROL	
National Institute for Occupational Safety and Health	
Energy Employees Occupational Illness Compensation Program Act (EEOICPA)	55.358 ¹⁹¹
Total	118.628
Total HHS Budget	715,790.000¹⁹²
Deferred environmental and health costs	55.358
Victim compensation	55.358
Nuclear incident management	63.270
Emergency preparedness	63.270
Assistant Secretary for Preparedness and Response Operations (estimated amount for nuclear/radiological terrorism)	63.270

189. Reflects an “all hazards” approach, with little specific nuclear-related activity. U.S. Department of Health and Human Services, “Fiscal Year 2009: General Departmental Management, Office of Medicare Hearings and Appeals, National Coordinators for Health Information Technology, Public Health and Social Services Emergency Fund, Health and Human Services General Provisions,” justification of estimates for appropriations committees, 290-296 (see subsequent pages for details on BioShield), www.hhs.gov/budget/09budget/budgetfy09cj.pdf.

190. This is 10 percent of the total amount.

191. This was funded through the Department of Labor until FY 2009. U.S. Department of Health and Human Services, “Fiscal Year 2009: Centers for Disease Control and Prevention,” justification of estimates for appropriation committees, 17, 311, www.cdc.gov/fmo/PDFs/FY09_CDC_CJ_Final.pdf.

192. Total includes Medicare payments. U.S. Department of Health and Human Services. “Budget in Brief: Fiscal Year 2009,” budget, 1, www.hhs.gov/budget/09budget/2009BudgetInBrief.pdf.

TABLE 17. *Environmental Protection Agency*

Program	FY 2008 Appropriations (millions of dollars)
HOMELAND SECURITY AND FORENSIC SUPPORT PROGRAMS	14.882 ¹⁹³
AIR AND TOXICS QUALITY	
Radiation: Protection	12.144 ¹⁹⁴
Radiation: Response Preparedness	6.561 ¹⁹⁵
SUPERFUND CLEANUP	
Federal Facilities	18.868 ¹⁹⁶
Federal Facilities Enforcement	5.836 ¹⁹⁷
Total	58.291
Total EPA Budget	7,472.344¹⁹⁸
Deferred environmental and health costs	
Environmental management and cleanup	24.704
Nuclear incident management	
Emergency preparedness	14.882
Homeland Security and Forensic Support Programs	14.882
Incident response	18.705
Radiation: Protection	12.144
Radiation: Response Preparedness	6.561

193. U.S. Environmental Protection Agency, "FY 2009 Annual Plan," annual plan, 160, 222–223, www.epa.gov/ocfo/budget/2009/2009ap/2009_annual_plan.pdf.

194. Excludes \$2.342 million to support Superfund projects. *Ibid.*, 227.

195. *Ibid.*, 228.

196. Assumes 60 percent of total program cost attributable to DOE nuclear facilities. U.S. Environmental Protection Agency, "2009 Annual Performance Plan and Congressional Justification," justification of estimates, 600–603, www.epa.gov/ocfo/budget/2009/superfund1.pdf.

197. Assumes 60 percent of total program cost attributable to DOE nuclear facilities. *Ibid.*, 530–531.

198. U.S. Environmental Protection Agency, "FY 2009 Budget in Brief," budget, February 2008, D-2, www.epa.gov/ocfo/budget/2009/2009bib.pdf.

TABLE 18. *Nuclear Regulatory Commission*

Program	FY 2008 Appropriations (millions of dollars)
HOMELAND SECURITY (cross-cut; includes reactor licensing and oversight, fuel facilities, nuclear materials users, spent fuel storage and transportation)	72.100 ¹⁹⁹
Total	72.100
Total NRC Budget	926.100²⁰⁰
Percentage nuclear weapons-related	7.785%
Nuclear threat reduction	72.100
Prevention/securing	72.100
Homeland Security	72.100

199. \$11.2 million was allocated for "International Activities" in FY 2008, including work on registering and regulating radioactive sources; \$2.2 million of this was counted as homeland security. These are bilateral and multilateral activities, some of which involve the IAEA. For FY 2007, this category included costs associated with the Yucca Mountain high-level waste repository and low-level waste handling. U.S. Nuclear Regulatory Commission, "Performance Budget: Fiscal Year 2009," budget, February 2008, vol. 24, 115; www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1100/v24/sr1100.pdf. U.S. Nuclear Regulatory Commission, "Performance Budget: Fiscal Year 2008," budget, February 2007, vol. 23, 130; www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1100/v23/sr1100.pdf.

200. Nuclear Regulatory Commission, "Performance Budget: Fiscal Year 2009," 5.

TABLE 19. *Department of the Interior*

Program	FY 2008 Appropriations (millions of dollars)
Office of Insular Affairs	
COMPACT OF FREE ASSOCIATION/ASSISTANCE TO THE MARSHALL ISLANDS ²⁰¹	
Trust Fund	9.714 ²⁰²
Rongelap Resettlement	0.000 ²⁰³
Kwajalein Lease Payment	16.190 ²⁰⁴
Enewetak—Section 103 (f)(2)(c)(i)	1.403 ²⁰⁵
Total	27.307
Total Interior Budget	16,883.844²⁰⁶
Nuclear forces and operational support	16.190
Deferred environmental and health costs	11.117
Victim compensation	11.117

201. Excludes \$8.344 million for the Office of Insular Affairs (p. 47).

202. U.S. Department of the Interior, "Budget Justifications and Performance Information: Fiscal Year 2009, Office of Insular Affairs," budget justification, February 4, 2008, 19; www.doi.gov/budget/2009/data/greenbook/FY2009_OIA_Greenbook.pdf.

203. This was \$1.760 in FY 2007. U.S. Department of the Interior, "Budget Justifications and Performance Information: Fiscal Year 2009 Office of Insular Affairs," 19.

204. Supports both nuclear forces and missile defense testing. *Ibid.*, 19.

205. *Ibid.*

206. U.S. Department of the Interior, "Appendix A: Comparison of 2007, 2008, and 2009 Budget Authority, comparative chart, A16; www.doi.gov/budget/2009/09Hilites/A001.pdf.

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