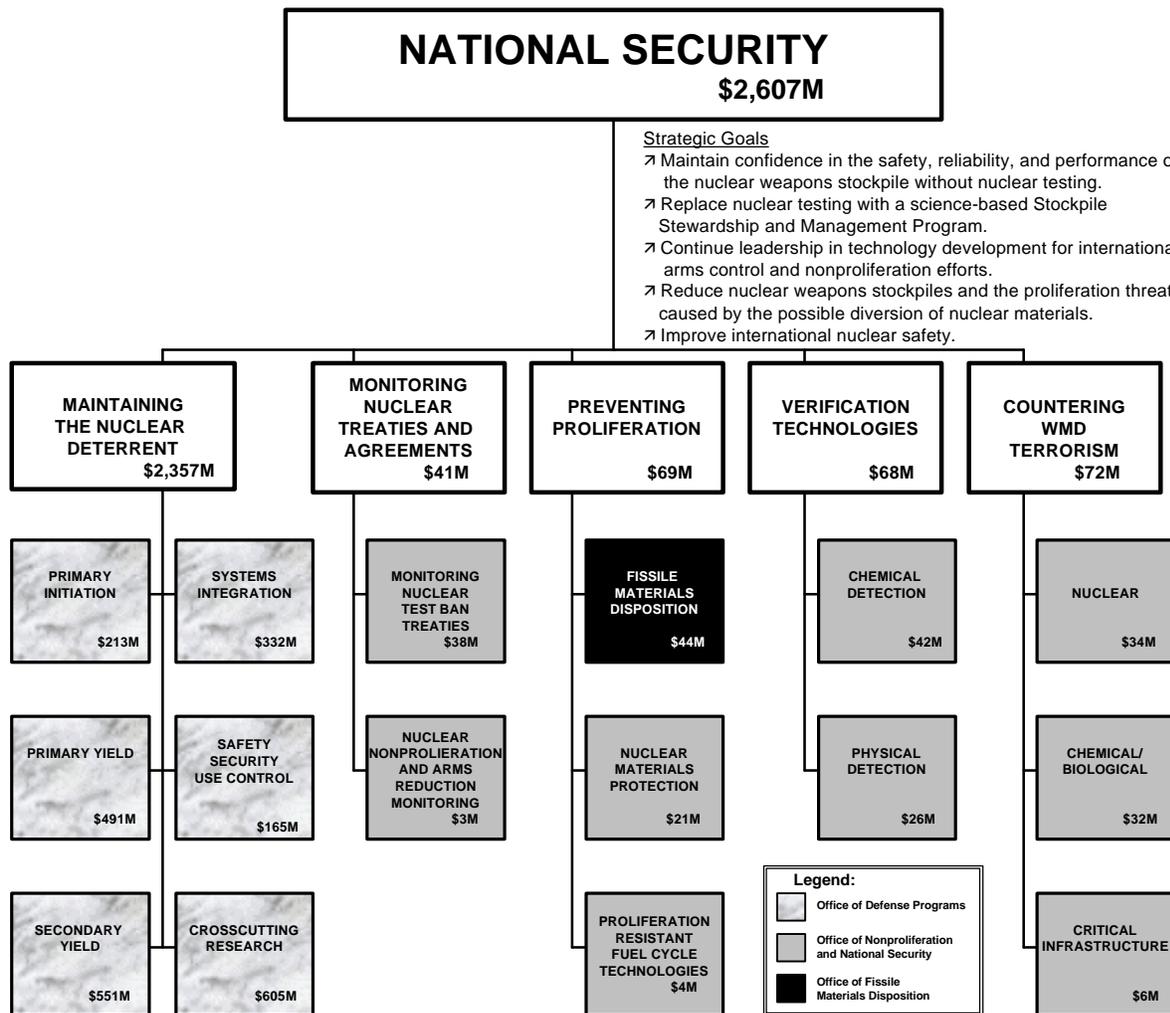


Chapter 2 Portfolio Analysis



Chapter 2

Portfolio Analysis

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The Context for the National Security Research and Development Portfolio

The Department of Energy's national security research and development responsibilities have traditionally been focused on matters regarding nuclear weapons, special nuclear materials, nuclear security and safety, arms control, and nonproliferation. DOE is an integral part of the U.S. national security community and plays an essential role in the provision of unique technical expertise in support of the Department of Defense, the State Department, and other agencies focused on reducing the global danger from nuclear weapons or other weapons of mass destruction, and improving international nuclear safety.

Over the past several years, the United States national security policies have undergone profound change to reflect the new and evolving geopolitical and military realities of the post Cold War world. Reflecting these changes, DOE has shifted its priorities toward enhancing activities which advance the Nation's nonproliferation and international nuclear safety policies while maintaining the viability of deterrence with a smaller, more agile, secure nuclear weapons complex.

In this environment, DOE is committed to a science-based program to maintain confidence in the nuclear weapons stockpile without testing, as required under the Comprehensive Nuclear-Test-Ban Treaty. DOE is also committed to safely disposition the nuclear fissile materials made surplus by the downsizing of the nuclear arsenal in conformance with arms control and nonproliferation treaty requirements, counter the proliferation of weapons of mass destruction, and further international safeguards. The Department foresees a future national security environment with continued uncertainty and risks of international terrorism from weapons of mass destruction.

The Department's goals are reflected in its seven national security objectives:

- **Objective 1**—Maintain confidence in the safety, reliability, and performance of the nuclear weapons stockpile without nuclear testing.
- **Objective 2**—Replace nuclear testing with a science-based Stockpile Stewardship and Management Program.
- **Objective 3**—Ensure the vitality of DOE's national security enterprise.
- **Objective 4**—Reduce nuclear weapons stockpiles and the proliferation threat caused by the possible diversion of nuclear materials.
- **Objective 5**—Continue leadership in policy support and technology development for international arms control and nonproliferation efforts.
- **Objective 6**—Meet national security requirements for naval propulsion and for other advanced nuclear power systems.
- **Objective 7**—Improve international nuclear safety.

The research and development activities described in the following chapters demonstrate both significant activity changes since the end of the Cold War and how DOE is investing its resources to solve the current critical national security issues the nation faces.

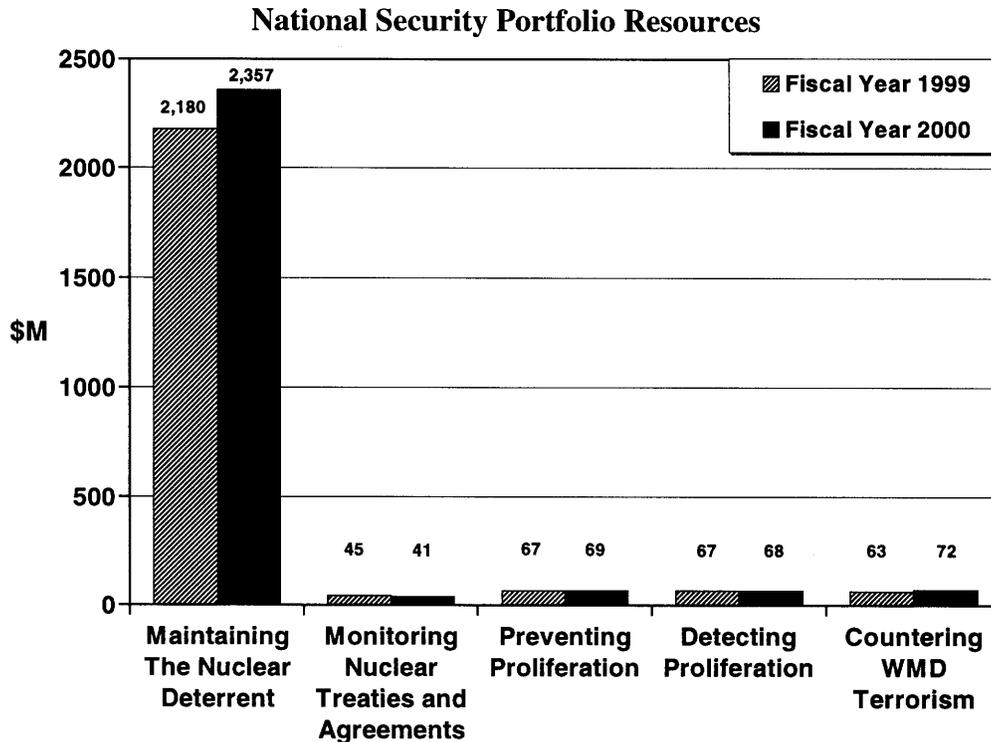
The DOE Research and Development Portfolio

National security is the constitutional mandate of the Federal Government, without a commercial/industrial analog. Resource allocations and funding are entirely driven by the need to maintain the country's national security in a rapidly changing post Cold War world facing a less defined, more diffused threat. While most of DOE's national security activities are not usually widely publicized, we are acutely aware of our need to uphold the public's trust that we will fulfill our important national security mission.

The DOE national security research and development portfolio has been structured to address five primary activity areas that respond to DOE objectives:

- Maintaining The Nuclear Deterrent.
- Monitoring Nuclear Treaties and Agreements.
- Preventing Proliferation.
- Verification Technologies.
- Countering Weapons of Mass Destruction Terrorism.

The distribution of the portfolio's resources to address these issues is shown in the figure on the following page.



The National Security Research and Development Portfolio’s resources have been balanced in accordance with DOE’s strategic plan along with numerous factors related to national needs. Maintaining the nation’s nuclear deterrent in the absence of underground nuclear testing is a very resource-intensive challenge for the Department of Energy. The Department’s goal for a science-based stockpile stewardship approach requires a large investment in new technology and research to develop and validate science-based methods to ensure the safety and reliability of the nuclear deterrent.

The nuclear weapons research and development activities are considered to be “applied research.” Some of the research is quite basic in nature but is pursued under this portfolio because of its value to specific applied problems of maintaining the stockpile. All of the budget of the “stewardship” portion of Defense Programs has been included in the funding summaries provided here. The “management” portion of the budget has not been included except for the Enhanced Surveillance Program that develops new means of examining weapons from the stockpile. The budget accounted here is consistent with the budget submissions to Congress and with that reported to the National Science Foundation as applied research and development. However, this is the first time that the funds have been attributed to the strategic functions described herein. This distribution has been done approximately; for example, the costs of the National Ignition Facility construction have been attributed 1/3 to Primary Yield and 2/3 to Secondary Yield, according to an ad hoc technical judgement. The budget and work described have not been managed or tracked to the strategic weapon functions used to describe the portfolio. Thus the budget information presented here is notional but provides a technical judgement as to the amplitude of research and development funding in each of the specified categories.

Although at a lower level of funding, the Department of Energy's other national security research and development programs are making considerable progress in meeting their important objectives. The Department of Energy continues its long history of developing technology to monitor nuclear treaties and agreements. In response to profound world-wide political changes, during the last decade, the Department has increased its activities in the areas of developing technology to detect and prevent proliferation. DOE's investments in preventing proliferation are 'opportunity driven' and we expect that changes in DOE's level of investment will be closely correlated with these new opportunities.

While research and development in countering weapons of mass destruction terrorism is not new to the Department of Energy, changing world events have clearly demonstrated that terrorism is rapidly becoming a primary threat to national security. The Department recognizes that its existing expertise in nuclear weapons is a valuable asset to meet the challenges of terrorism and is leveraging the DOE Laboratories' large investment in chemical and biological sciences to support the national effort.

DOE places a high priority on its R&D so that essential long-term goals are not sacrificed to address current problems. Solving challenging problems often involves long-term, long lead time research. Within the R&D planning process, decisions are continually being made in the planning-programming-budgeting process in order to keep the priorities in rank order. At the same time, however, it must be recognized that R&D, which is one of the most important DOE functions, cannot remain healthy and vibrant within a rapidly varying funding environment.

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The portion of this R&D portfolio on "Maintaining the Nuclear Deterrent" is not comprehensive. Example activities are given to provide a concept of this research and development function in an unclassified manner. A comprehensive and classified description of the Stockpile Stewardship program is the "FY2000 Stockpile Stewardship Plan" and its predecessor documents, also known as the "Greenbook." These comprehensive documents describe both the nuclear weapon research and development activities and the weapon production and management activities of the DOE. The "Executive Overview: FY2000 Stockpile Stewardship Plan" (March 1999, DOE, Defense Programs) is a useful unclassified summary. The original definition of the Stewardship Program, "The Stockpile Stewardship and Management Program: Maintaining Confidence in the Reliability of the Enduring U.S. Nuclear Weapon Stockpile" (May 1995, DOE, Defense Programs), remains valid in setting out the program rationale.

This research and development portfolio describes the nuclear weapons program along the lines of its strategic components of weapon function: primary initiation; primary yield; secondary yield; system integration; safety, security, and use control. In addition a section on crosscutting research describes activities not uniquely or readily attributable to only one or two of these strategic elements. At the present time extensive program planning is underway linked to these strategic elements. Activities are being aggregated in "campaigns" that have specific deliverables and end dates related to these weapon function elements and to specific weapon certification and refurbishment. The first set of campaigns will extend to about the year 2005 and describe a

nuclear weapon program that depends, in part, on the nuclear test history and at the same time defines how the stockpile can be maintained without future nuclear tests, relying on research and development results. Both this R&D portfolio and the campaigns delineate improvements in research and development capabilities that extend well beyond the year 2005 and are critical to sustaining the stockpile indefinitely without testing.

For the nuclear weapons program, a recent survey identified eight categories of external reviews with multiple specific reviews attributable to each category. Many of these are science reviews, including: JASON, the National Academy of Sciences, ad hoc program review groups, and laboratory specific reviews. It is anticipated that this program will continue to be subject to multiple external reviews. The campaigns that are in planning and the anticipated reviews will lead to extensions of the nuclear weapons portion of this portfolio.

Portfolio descriptions provided in the following chapters on “Monitoring Nuclear Treaties and Agreements”, “Preventing Proliferation”, “Verification Technologies”, and “Countering Weapons of Mass Destruction Terrorism” represent comprehensive descriptions of their contributions to the DOE National Security R&D Portfolio. The relevance of each part of the Portfolio in the context of enhancing the nation’s national security is explained.

This presentation and description of the portfolio and its relevance to national interests is an important first step in portfolio development and analysis, but is only a beginning. This document demonstrates that the DOE portfolio meets multiple objectives with the robustness required for an uncertain future, but continued and expanded planning and analysis is needed to insure appropriate prioritization and efficient utilization of taxpayer funds applied to these efforts. Future steps should include expansion of current technology and program roadmapping.

The Department of Energy has initiated the process of establishing a Nonproliferation and National Security Advisory Committee in accordance with Section 9 of the Federal Advisory Committee Act, Pub. L., No. 92-463, and Executive Order 12838. The Advisory Committee will be available to provide an external review of any research and development activity within the Office of Nonproliferation and National Security.

Future changes to portions of the portfolio will occur because of new opportunities, technological developments, and requirements from unfolding national and international events. Strategic planning, portfolio analysis, and technology roadmapping will provide the framework to keep pace with demanding national security needs.

