Stockpile Readiness

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Development and Testing
B&R Code: GB0103141

Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

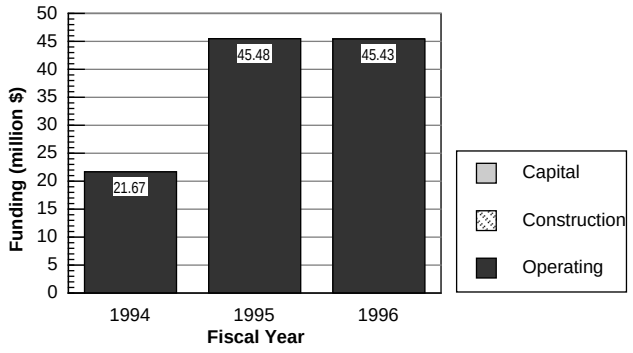
The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. The Stockpile Readiness activity supports the stewardship of the nuclear weapons stockpile and includes the development for and support of the day-to-day activities needed to support the evaluation and maintenance of nuclear weapons in the active and inactive stockpile. It also directly supports Science-Based Stockpile Stewardship by increasing our understanding of stockpile aging and reliability. Stockpile Readiness includes development activities supporting weapons such as stockpile maintenance, stockpile evaluation, and stockpile technical support and excludes direct weapon development.

Stockpile Maintenance—Those activities directly associated with maintaining the weapons in the stockpile and associated ancillary gear. This task provides design support for Stockpile Management activities not directly tied to a specific weapon.

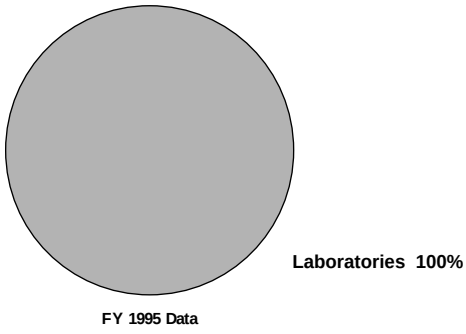
Stockpile Evaluation—Those activities associated with understanding the quality, reliability, surety, and revalidation of weapons and components in the existing stockpile. Stockpile evaluation also includes surveillance activities on existing stockpile weapons and components to assure the reliability and safety of fielded weapons. Laboratory tests focus on detecting defects due to aging, manufacture, and/or design. Flight tests are concerned primarily with the integration and functionality of electrical and mechanical subsystems.

Stockpile Technical Support—Those activities necessary for military liaison, emergency response, and associated technical requirements for weapons. Activities, such as military liaison and supporting Project Officer Meetings are included.

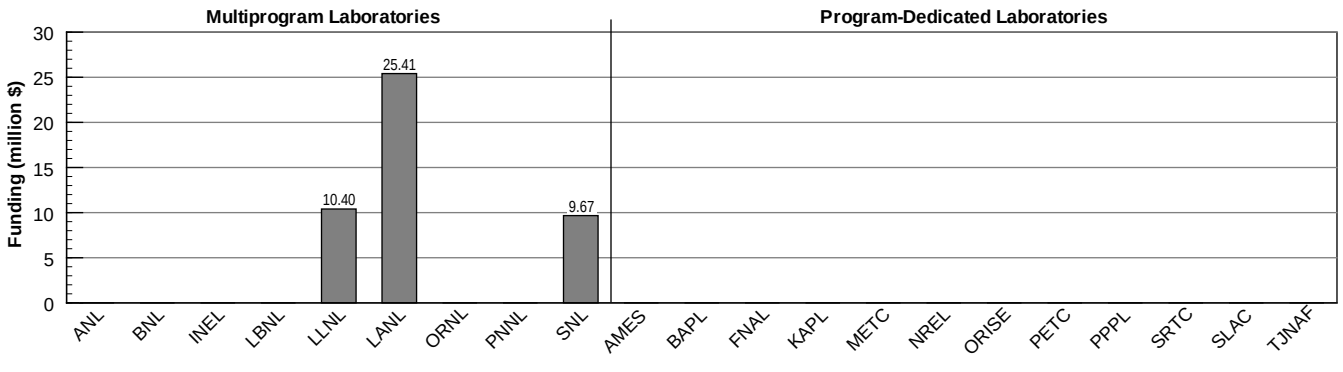
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Enduring Stockpile

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Development and Testing
B&R Code: GB0103145, GB0103143

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LANL, LLNL
Participating Laboratories: None

Mission Activity Description

The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. This includes not just maintenance, but also improvements to the nuclear weapons necessary to ensure their safety, security, and reliability in the enduring stockpile (those weapons that will remain in the stockpile for a prolonged period of time). The Enduring Stockpile activity is part of the DOE's effort to ensure the safety and reliability of U.S. nuclear weapons. To achieve its purpose, the Enduring Stockpile activity includes all activities for demonstrating or implementing stockpile improvements on weapons in the enduring stockpile. It includes those activities on stockpile weapons that are intended to:

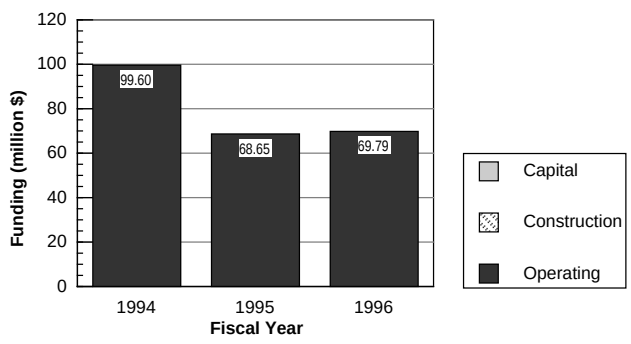
- Extend weapon life
- Improve surety (that is, safety, reliability, and use control)
- Improve operational reliability and utility

The two major subprograms in the Enduring Stockpile activity are the stockpile improvements program and the stockpile option program.

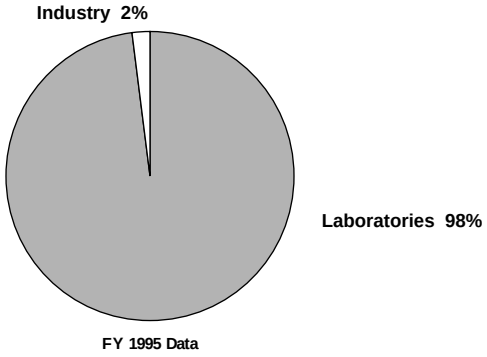
Stockpile Improvement Programs—Those activities for concept definition, feasibility studies, development engineering, and production engineering of weapon alterations, modifications, or replacements formally approved or requested by the Department of Defense.

Stockpile Option Programs—In the absence of appropriate sanctioned stockpile improvement activities, those activities that maintain and demonstrate the Department of Energy's capabilities associated with stockpile improvements and for replacing or remanufacturing stockpile weapons by researching possible options.

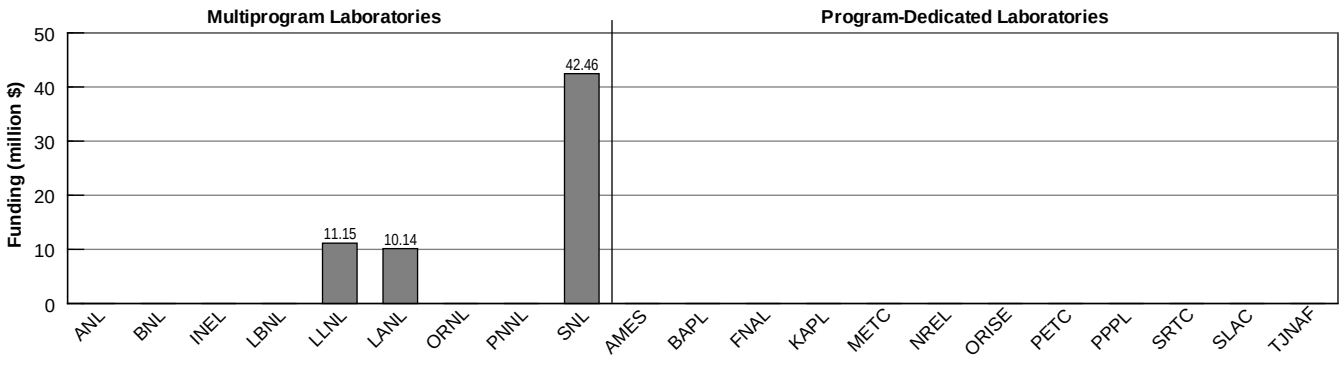
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Future Stockpile

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Development and Testing
B&R Code: GB0103144, GB0103146

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LANL
Participating Laboratories: LLNL

Mission Activity Description

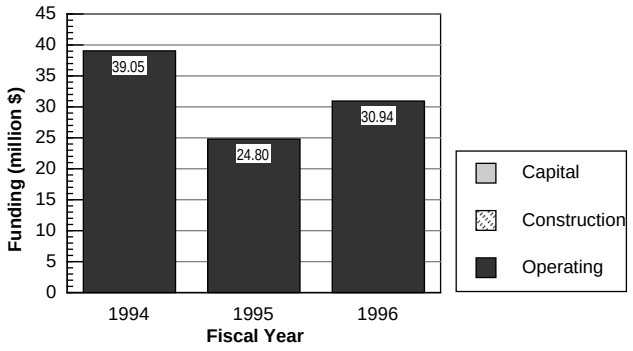
The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. This includes, besides maintenance and stockpile improvements, new capabilities needed for future weapon options. The Future Stockpile activity is part of the DOE's effort to ensure the safety and reliability of the nuclear weapon deterrent for the future. The purpose of the Future Stockpile activity is to provide non-weapon-specific developmental activities for anticipating nuclear weapon needs and examining future nuclear weapon options. The activities in the Future Stockpile activity include development for joint Department of Defense (DOD) and DOE studies, enhanced surety (safety, security, and use control), and future technologies.

Joint DOD and DOE Phase Studies—Those activities with DOD to develop weapons concept definition, feasibility, or assessments of new weapons capabilities.

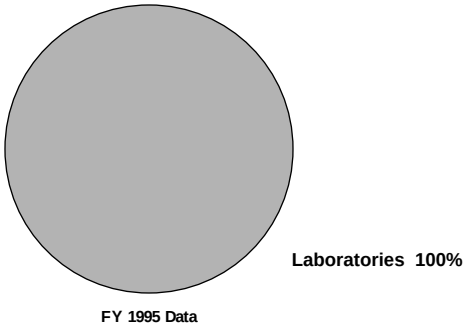
Enhanced Surety—Those development activities involving use control, security, and safety concepts or feasibility. Principally non-weapon-specific nuclear and nonnuclear technologies aimed at meeting anticipated future surety requirements to be applied as upgrades or retrofits to existing weapons.

Future Technology—Those development activities examining non-weapon-specific (that is, general concepts or technologies that may be employed in new or modified designs, such as ceramic-coated fire resistant pits) nuclear and nonnuclear technologies addressing anticipated future stockpile weapons needs to maintain their performance and reliability.

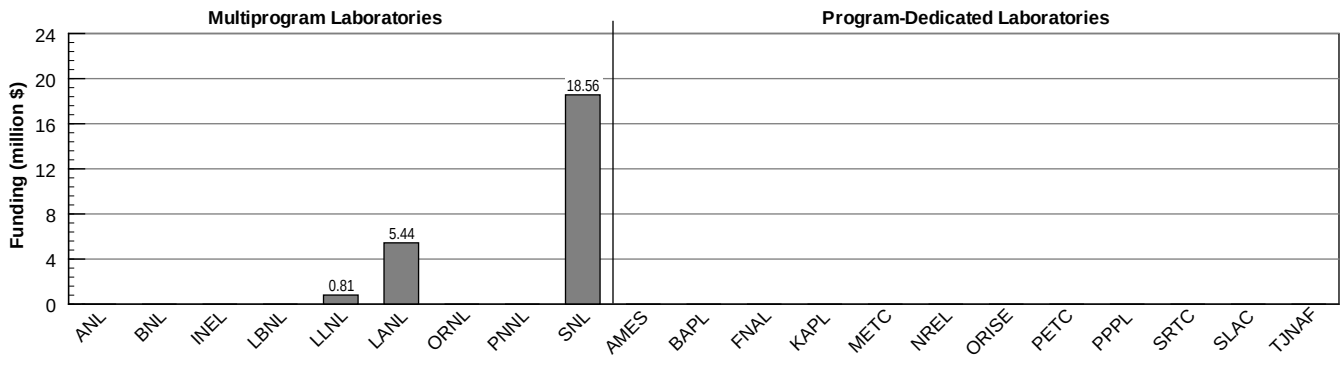
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Stockpile Reduction

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Development and Testing
B&R Code: GB0103142

Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

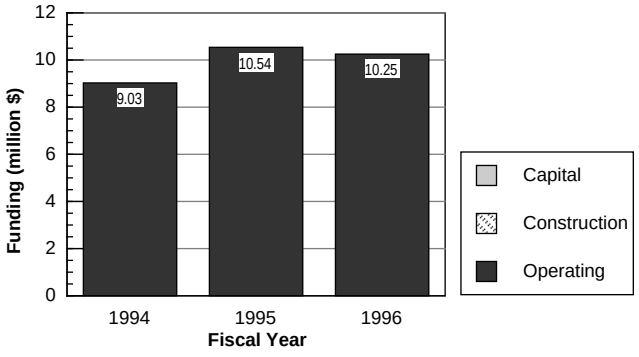
The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. This includes both the dismantlement and disposal of nuclear weapons and their components. The Stockpile Reduction activity is part of the DOE's effort to provide support for the safe and secure dismantlement of retired nuclear weapons. The increase in dismantlement brings an increased awareness of current environmental safety and health requirements compliance. The three nuclear laboratories provide the unique technical expertise, diversity of research capabilities, and many years of experience necessary to provide safe and reliable methods for dismantling and storing nuclear weapons. Storage or disposal of components at Pantex, Y12, or other sites will require modern criteria to be considered and design agency presence, and involvement in, the dismantlement of weapons and components. The Stockpile Reduction activity supports the development activities for dismantling weapons and disposing of components and materials. These activities include development for weapon dismantlement, disposal, and storage.

Weapon Dismantlement—Those activities to ensure the safe and secure dismantlement of weapons being removed from the existing stockpile. This includes activities such as studies on dismantlement techniques.

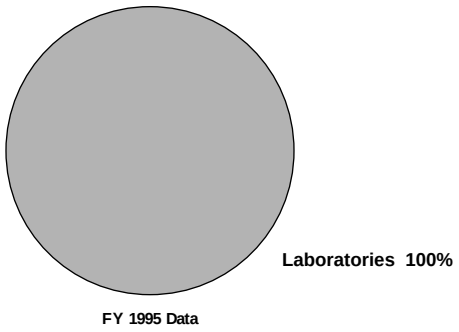
Disposal—Those activities to ensure environmentally safe disposal of dismantled weapon parts and components. This includes activities such as R&D on remediation of former storage and disposal areas.

Storage—Those activities necessary for safe and secure storage of critical nuclear materials and components. This includes investigation of newer, more effective, and less expensive monitoring techniques.

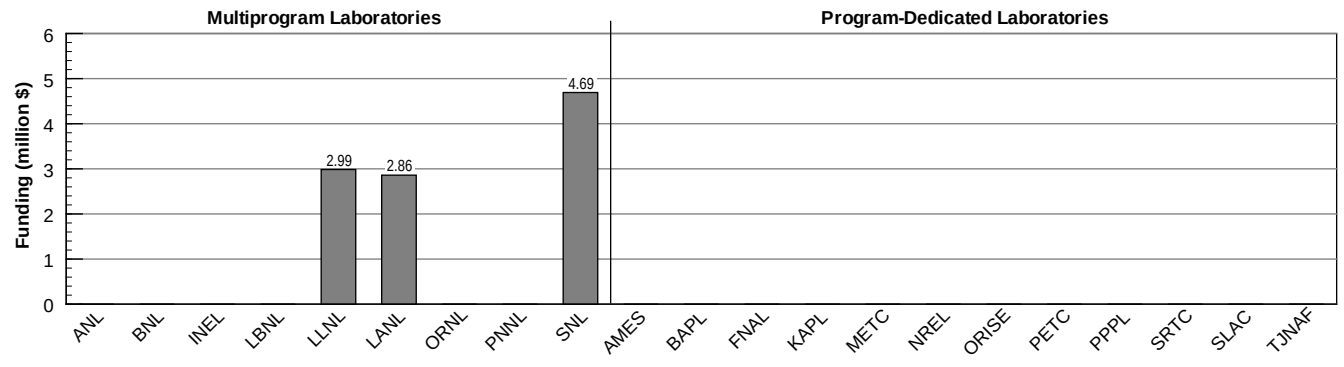
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Experimental Activities

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Development and Testing
B&R Code: GB0108

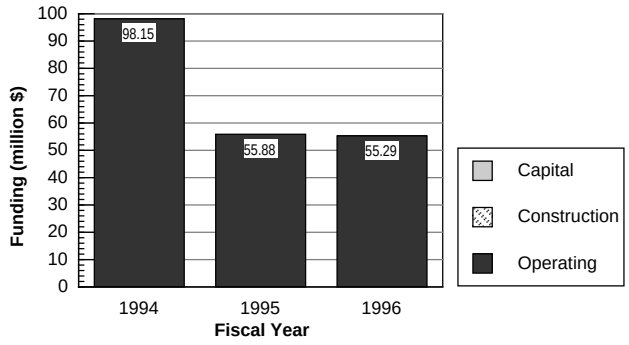
Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

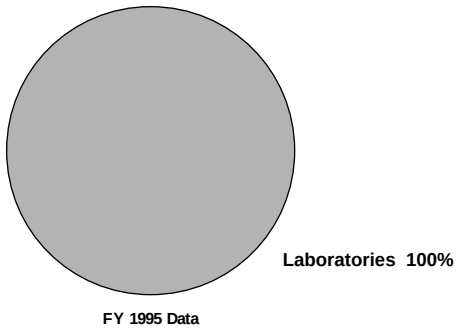
Mission Activity Description

The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. When the President announced the zero-yield Comprehensive Test Ban Treaty on August 11, 1995, he indicated U.S. participation was conditioned on several safeguards. One of the safeguards requires a Science-Based Stockpile Stewardship program "including the conduct of a broad range of effective and continuing experimental programs." Experimental activities will provide data to baseline the current stockpile, and also provide input for the Nation's ongoing Science-Based Stockpile Stewardship program to gain an understanding of stockpile aging and effects on reliability. Subcritical experiments at the Nevada Test Site coupled with hydrodynamic experiments at the National Laboratories are planned and approved means designed to compensate for the loss of underground nuclear testing. DOE is also responsible for Nevada Test Site readiness—that is, if a nuclear test were required to resolve an unforeseen problem that might arise to seriously jeopardize the safety and/or reliability of a stockpile system. A program of underground subcritical experiments at the Nevada Test Site will provide tangible assurance that this Presidential requirement is being met. Moreover, by providing data in an ongoing experimental program within Science-Based Stockpile Stewardship, it will be much less likely that the Nation will be confronted with a stockpile emergency that requires a nuclear test for resolution.

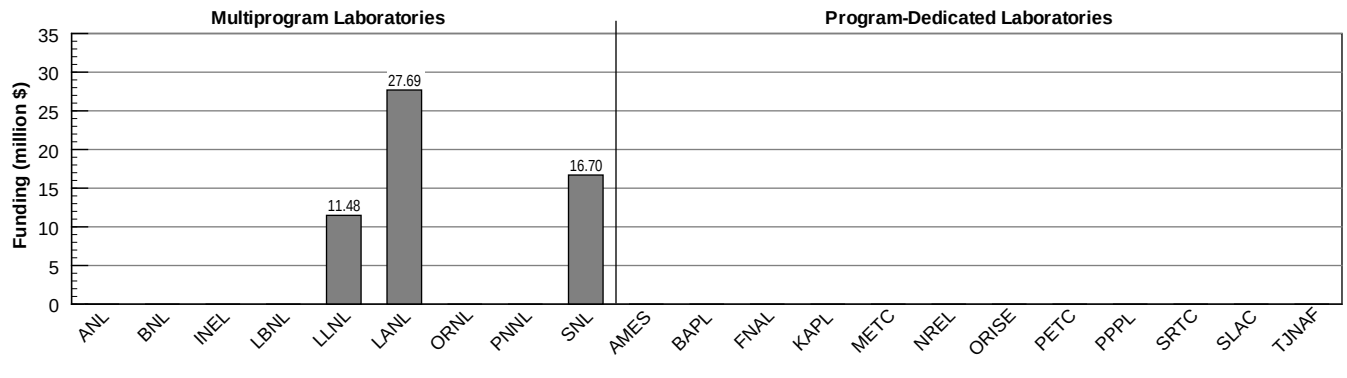
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Weapons Transportation Safeguards

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103045

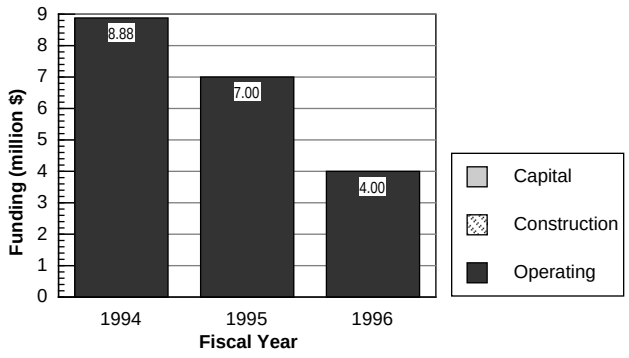
Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: None

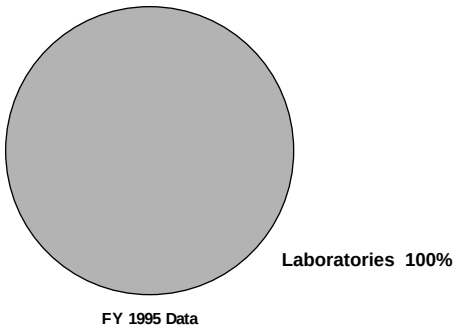
Mission Activity Description

Maintaining a safe and secure nuclear stockpile is one of the primary responsibilities of the Department of Energy. This includes periodic movement of nuclear weapons from one location to another. The Safe Secure Transport (SST) system utilizes specially constructed, monitored, escorted, and heavily protected tractor trailer trucks to move nuclear weapons and special nuclear material over the U.S. highway system. This has been the only authorized method of transportation available since the use of trains was eliminated. SNL has been involved in all aspects of the physical protection, mechanical packaging, and transportation requirements of the DOE nuclear weapons complex since the inception of the transportation program. The Albuquerque Operations Office coordinates the training and administration of the DOE courier and transportation program in conjunction with SNL. The Safe Secure Transport system is 20 years old, and SNL is developing a prototype replacement system called the SafeGuards Transporter to continue to provide a superior, state-of-the-art, and extraordinarily safe means of transporting nuclear weapons and associated sensitive materials. A sample of weapons transportation research activities includes: (1) development of an enhanced geographic-based vehicle tracking system, evaluating extendability and improved query response time using the spacial index, and demonstrating a real-time graphical user interface; (2) finalizing prototype fabrication and the design and production/operational readiness reviews for the SafeGuards Transporter and delivering the first production SafeGuards Transporter; and (3) continuation of a transportation risk assessment, to include statistical descriptions of heavy truck accident severities and analysis of plutonium dispersal for accidents involving SafeGuards Transporter designs.

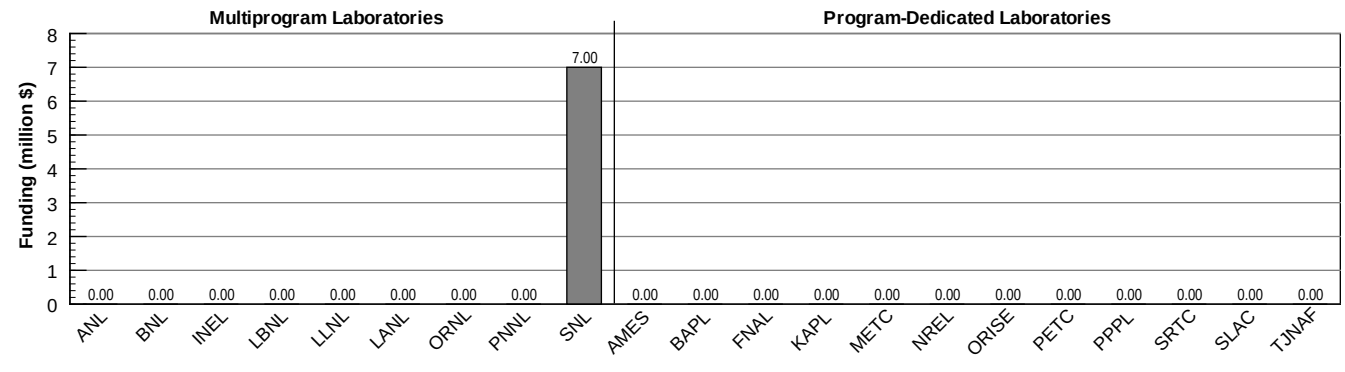
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Joint DOD/DOE Munitions Technology Development Program

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103049

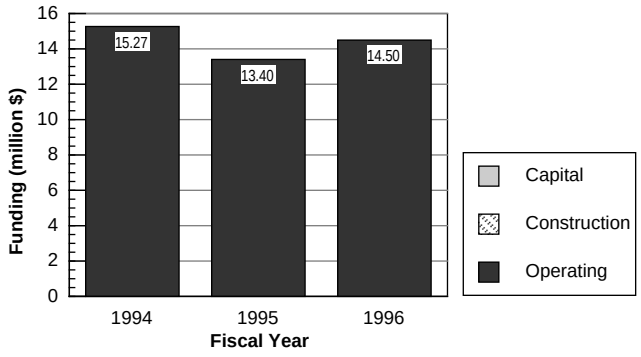
Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

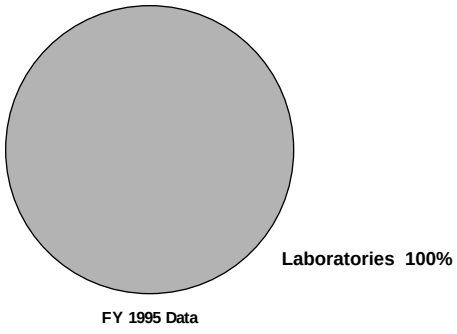
Mission Activity Description

In addition to the Department of Energy's primary responsibility for the nuclear weapons stockpile, its Defense Programs laboratories have considerable expertise applicable to conventional munitions. In 1985, DOE and the Department of Defense reached a joint agreement to utilize this expertise and the existing infrastructure at the Defense Programs laboratories to improve conventional munitions. The Joint DOD/DOE Munitions Technology Development Program falls under the auspices of this agreement, which is known as the Non-Nuclear Munitions Technology (NNMT) Memorandum of Understanding. A Technical Advisory Committee made up of representatives from each participating laboratory, DOE, and the Department of Defense receives input from 13 Technical Coordinating Groups that oversee research in specific areas. Progress is evaluated throughout the fiscal year. These evaluations are the basis for decisions to proceed with, modify, or halt ongoing research. This program is funded by the Department of Defense, with matching funds from DOE. It is a highly successful cooperative program of research and development in areas of mutual interest, which include energetic materials, electronics, warhead technology, and a variety or supporting technologies. A representative sample of the activities conducted in support of the NNMT Memorandum of Understanding includes: (1) measuring the mechanical properties of a range of explosives to support development of models of the behavior of damaged explosives; (2) making dramatic improvements in the synthesis of explosive formulations with higher energy content than HMX (the most powerful commonly used explosive and the Defense Department's explosive of choice) and with application as a melt-castable explosive (the preferred way to cast explosives); (3) investigating the effects of the percentage of load-bearing axial plies on the compressive strength of panels and cylinders in the application of advanced fiber composites to new munitions systems; and (4) developing new cryptographic protocols for secure remote access to sensitive computing and information resources.

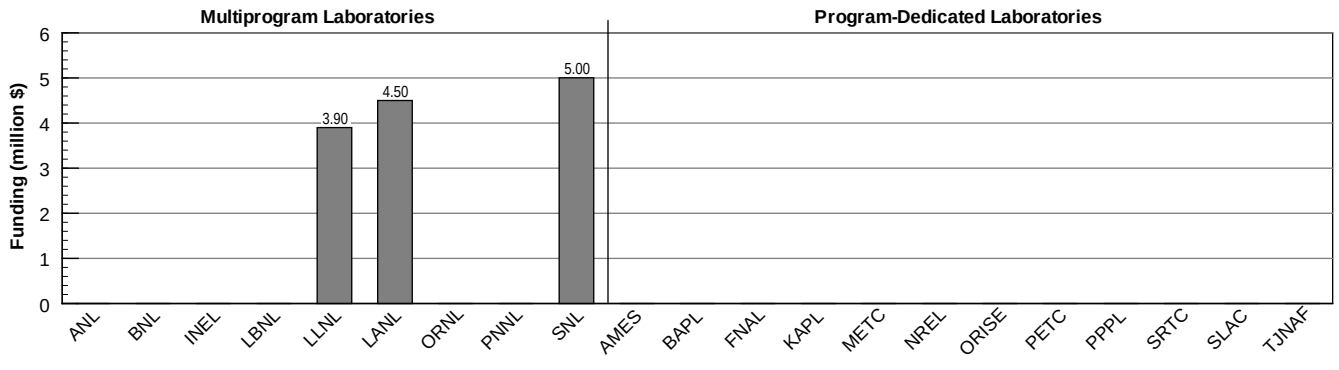
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Accelerated Strategic Computing Initiative

Department of Energy Program

Program: Defense Programs
Office: Strategic Computing and Simulation
Element: Accelerated Strategic Computing Initiative
B&R Code: New activity in FY96

Laboratory Complex

Principal Laboratories: SNL, LANL, LLNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

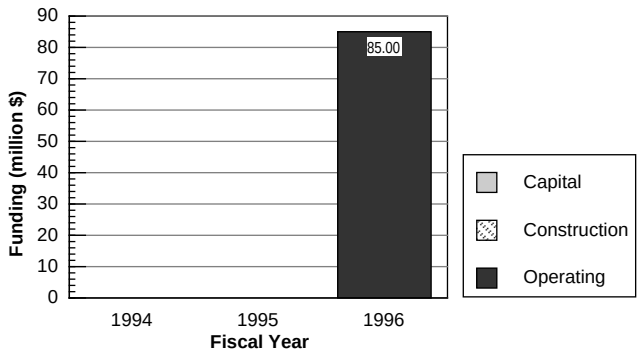
The Accelerated Strategic Computing Initiative (ASCI) is designed to accelerate the development of High Performance Computing (HPC) far beyond what might be achieved in the absence of a focused initiative. The program's goal is to provide the ability to analyze, evaluate, maintain, and prototype nuclear weapons and weapons components in the absence of underground nuclear testing. ASCI is an integrating element of the Stockpile Stewardship Program and complements the Core Computation Program by advancing Department of Energy Defense Programs computational capabilities to meet the future needs of stockpile stewardship. ASCI employs the expertise of scientists and engineers in weapons related disciplines and high-performance computing, and applies that expertise to shift from nuclear test-based methods to computational-based methods of weapon assessment. Some of the strategic thrusts of ASCI are described below.

Advanced Applications Development—ASCI seeks to provide simulations that embody 3-D capability, finer spatial resolution, and more refined physics necessary to predict the safety, reliability, performance, and manufacturability of weapons systems while eliminating empirical factors. A significant fraction of the increased computational capability envisioned by ASCI must come from improvements in the applications codes.

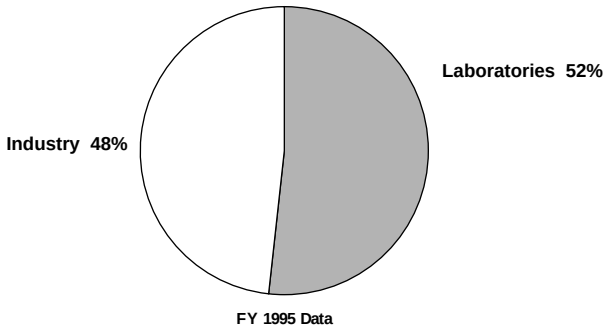
Focus on the High End of Computing—More powerful supercomputers are needed for virtual testing and prototyping applications. ASCI is stimulating the U.S. supercomputing industry to develop high-performance supercomputers with speeds and memory capacities thousands of times greater than currently available models and tens to hundreds of times greater than the supercomputers that are anticipated based on current trends in development.

Problem-Solving Environments—To couple the applications to the supercomputers and make them usable at desktops throughout the Defense Programs laboratory complex, ASCI will develop key elements needed for a computational infrastructure of high performance local area networks, wide-area networks, high-speed, high-capacity intelligent storage facilities, and software development and data visualization tools.

Funding History

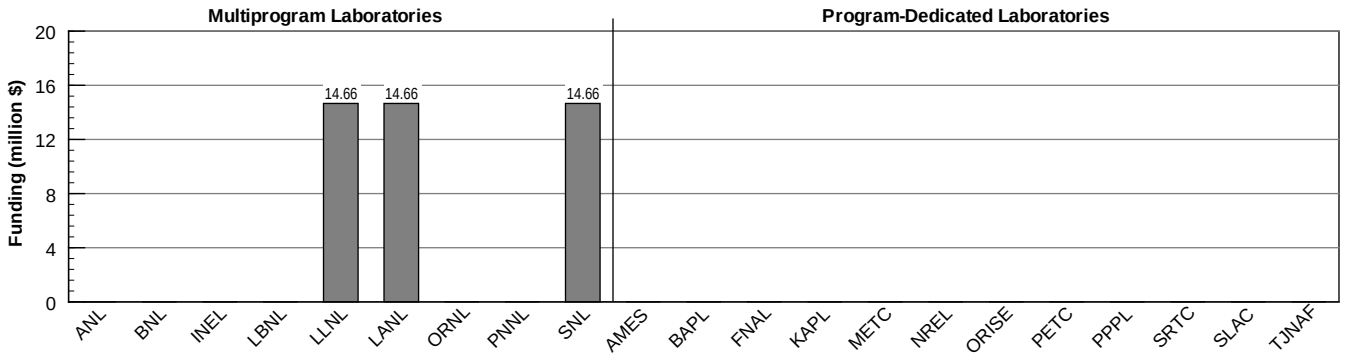


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1996 Funding Profile



Note: This activity was initiated in fiscal year 1996. No previous data are available.

Threat Assessment and Treaty Implementation

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB010316

Laboratory Complex

Principal Laboratories: LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: LANL

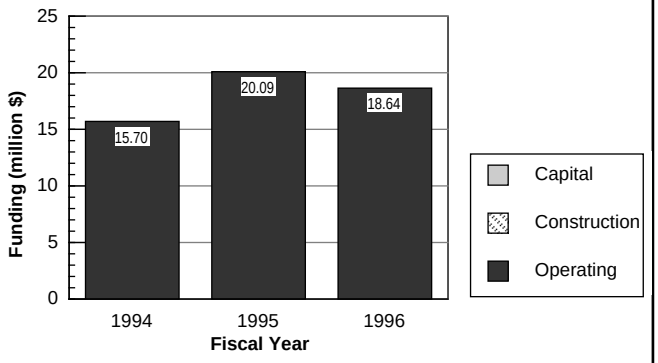
Mission Activity Description

The maintenance of a safe and secure nuclear weapons stockpile is a primary mission of the Department of Energy and its Office of Defense Programs. The Defense Programs laboratories (LLNL, LANL, and SNL) have been and continue to be the foremost authorities on design and construction of nuclear weapons and the conduct of associated research activities.

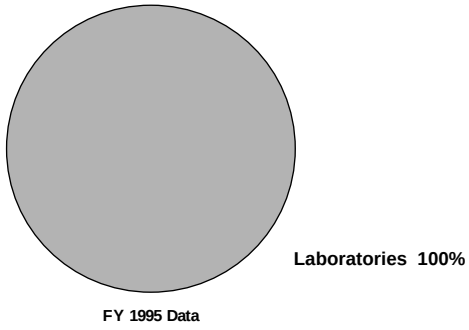
Because of their extensive experience with the characteristics of nuclear weapons programs, the expert staff of the Defense Programs complex, combined with the unique resources of the labs, play an important part in reducing the global danger of nuclear weapon proliferation. Improvements in systems studies, intelligence-related systems research, proliferation-related information management, knowledge preservation, proliferation training, and advice on implications of treaty implementation are all areas where the specialized expertise of the laboratory personnel can make invaluable contributions. Laboratory activities also focus on forging a link between national security programs and the Science-Based Stockpile Stewardship Program by providing assistance in assessing the value of technical developments by foreign powers for proliferation of nuclear weapons.

Additionally, DOE has gained significant insights into the characteristics to be expected of clandestine nuclear programs. This includes knowledge of types of nuclear devices that could be fabricated if an organization gained access to certain materials or technologies. Efforts by the Defense Programs laboratories to reduce the global nuclear danger include determining methods of response to proliferant nuclear devices. Developing proliferation response technologies includes researching technological avenues open to proliferants, detection technologies, and possible neutralization technologies. The Defense Programs laboratories also work in concert with other DOE offices to resolve difficult and sensitive issues in response to known and possible proliferant action.

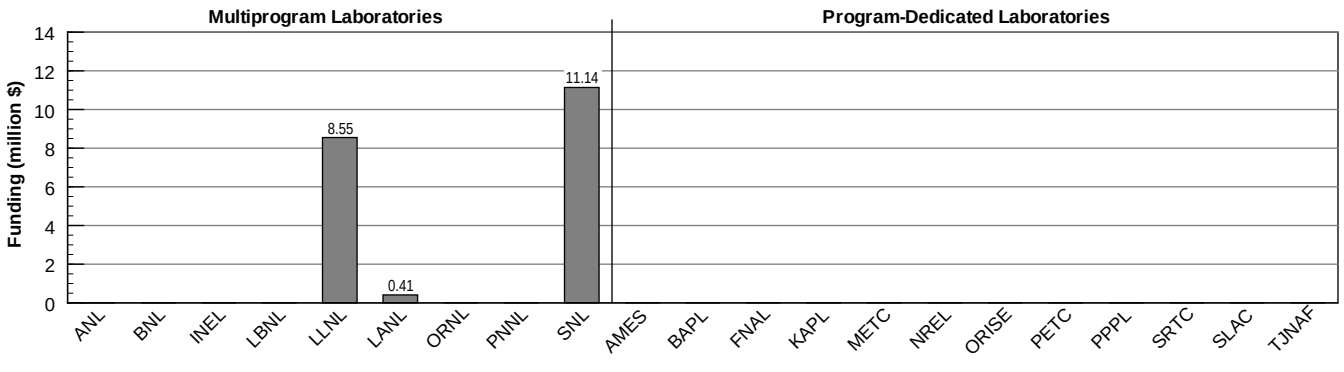
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Conceptual Design and Assessment

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103221

Laboratory Complex

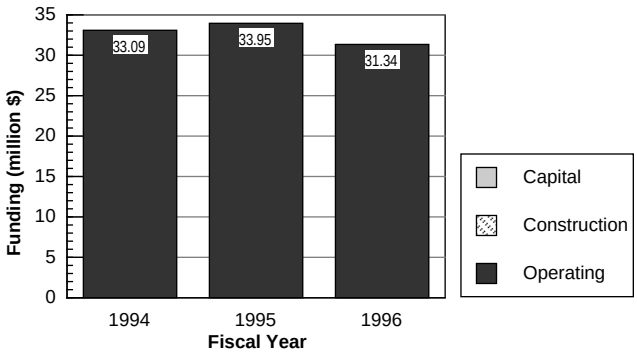
Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: ANL, ORNL

Mission Activity Description

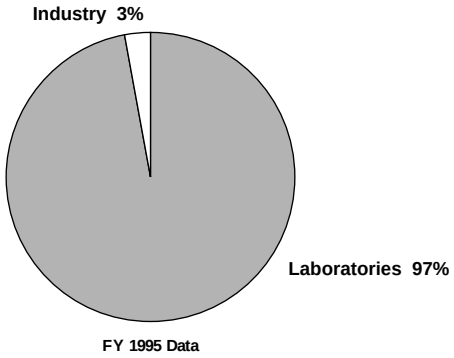
The Department of Energy has responsibility for the Nation's nuclear weapons stockpile, and its Defense Programs laboratories were established to design, develop, and test nuclear weapons. A primary function of these labs, in keeping with their mission, has always been to explore concepts and technologies that offer potential options for meeting future national security requirements. The curtailment of underground testing and cessation of directed nuclear weapon development activity did not relieve Defense Programs of the responsibility for retention of the core capability at the laboratories to conduct conceptual design and assessment activities. Maintenance of this core capability is critical because the scientists who carry out this research will participate in peer reviewed revalidation of weapons systems after the systems undergo rework.

The Conceptual Design and Assessment activity looks beyond proven concepts and outside of traditional methods, providing the new ideas needed to evolve and improve the stockpile, to anticipate and then meet the evolving needs of the military, and to maintain technological superiority. Concepts developed by this program are supported only through a "proof of principle" demonstration. When a new concept matures to the point of inclusion in a formally directed study, the concept is transferred into a program outside of the Core Research Program. These activities do not involve formal hardware development, but may include a limited amount of prototyping to demonstrate conceptual feasibility. A sample of the work conducted in support of this element includes: (1) benchmarking new computational methods for hydrodynamic instabilities; (2) using the Los Alamos Neutron Science Center (LANSCE) to study high explosive microstructure and aging effects using small angle neutron scattering; and (3) incorporating Smooth Particle Hydrodynamics (SPH) into the PRONTO finite element code, yielding a new, unique capability to model very high deformation impulsive loading.

Funding History

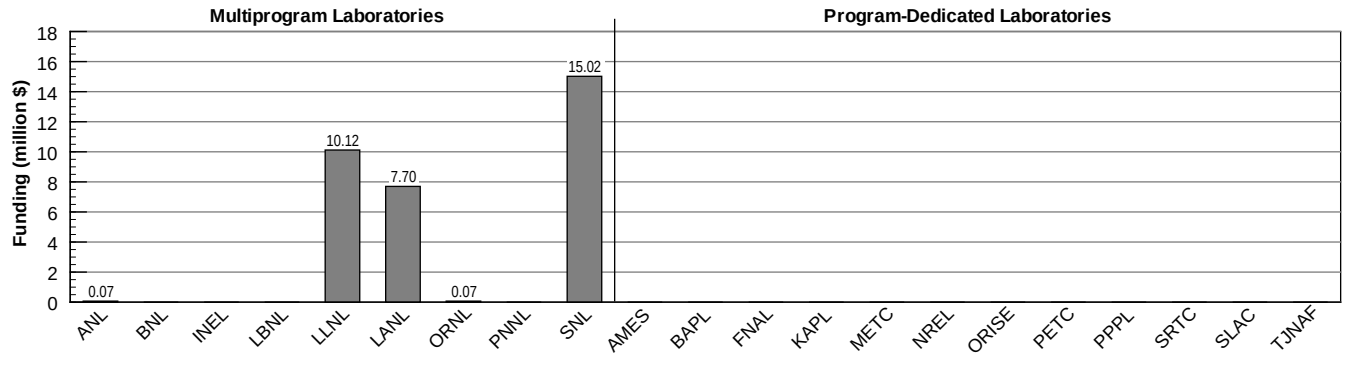


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Physics

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103222

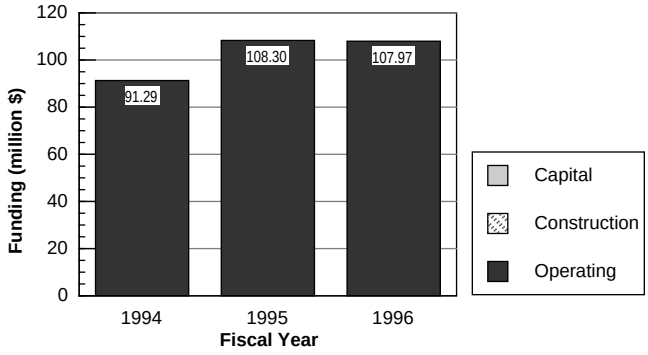
Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

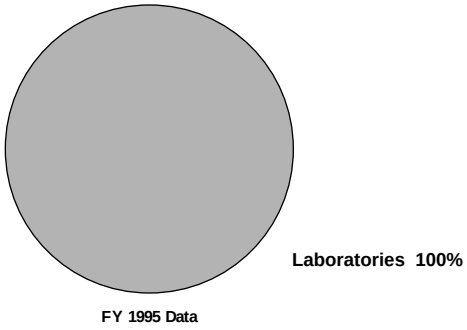
Mission Activity Description

The maintenance of a safe and secure nuclear weapons stockpile is a primary mission of the Department of Energy. Physics principles largely govern the behavior and performance of nuclear weapons; thus the Physics element of the Core Research and Advanced Technology Program plays a critical role in the maintenance of a safe and reliable U.S. nuclear deterrence capability. This program element, supporting the Science-Based Stockpile Stewardship Program, nurtures the essential scientific underpinnings needed to evaluate complex nuclear weapons systems and subsystems. It provides the foundation for many of the unique facilities and capabilities used to test and evaluate these systems and sustains basic weapons physics research for both nuclear and nonnuclear components. Basic and applied research in physics supplies both the theoretical models and experimental data for design and evaluation codes that simulate weapon performance, provide improved predictive capabilities, and allow the development of new concepts, all of which contribute to stockpile safety, security, and reliability. Physics experiments furnish the computer code benchmarks that are the foundation of Science-Based Stockpile Stewardship. Significant improvement in existing predictive capability is needed to ensure that should a weapon be modified, it will function as intended, and to maintain the confidence that dybanic/hydrodynamic testing will be sufficient to ensure the continuing credibility of the stockpile. Physics research deals with some of the most challenging issues in the U.S. Nuclear Weapon Program. Hydrodynamics, radiation physics, plasma physics, nuclear physics, solid-state physics, optical physics, and chemical physics issues are being addressed; in so doing, the program provides important basic understanding, code validation, and retention of the skills of theoretical and experimental scientists critical to Science-Based Stockpile Stewardship.

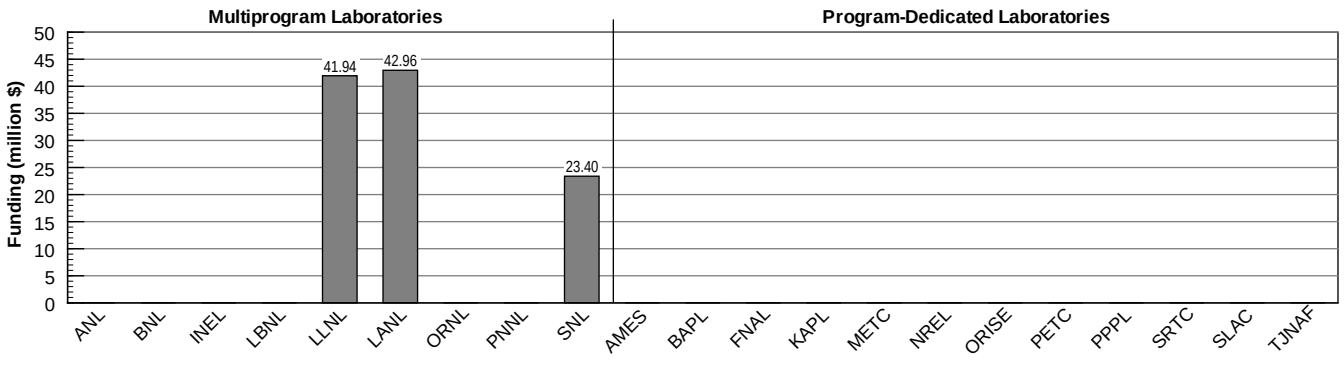
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Computation and Modeling

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103223

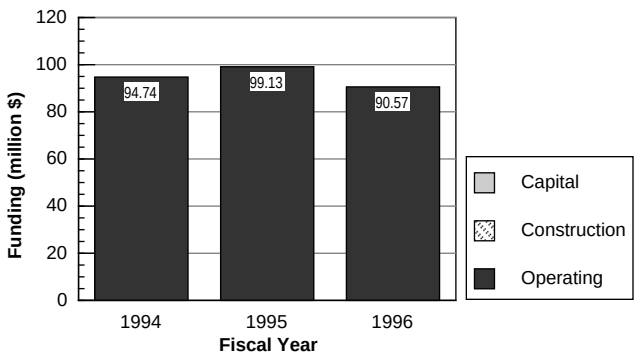
Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

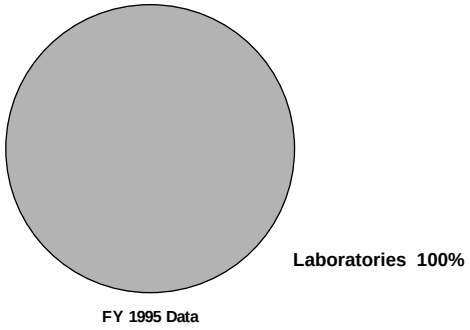
Mission Activity Description

The maintenance of a safe and secure nuclear weapons stockpile is a primary mission of the Department of Energy. Because nuclear weapons systems are extremely complex, computation and modeling are indispensable tools in the performance of that mission and are invaluable in all aspects of nuclear weapons research. Computation and modeling refers to the use of computers and mathematical algorithms to solve intricate problems and predict or explain phenomena that occur during the detonation of a nuclear weapon. Simulation and modeling decrease overall program costs by reducing risks, requirements for physical testing, and the time needed to complete involved calculations. In the absence of underground testing, this area represents the only method of validating performance predictions for weapon modifications and for revalidating modified systems. Computation and Modeling is considered a core competency of the Science-Based Stockpile Stewardship Program, and virtually all elements of the Core Research and Advanced Technology Program rely heavily on its capabilities to expedite completion of research activities. A sample of Computation and Modeling activities includes (1) completion of a major nuclear weapon safety calculation with the 1840-node SNL Paragon Massively Parallel Computer; (2) improvements to physics models, numerical solution algorithms, and computer science techniques in 2-dimensional (2D) and 3-dimensional (3D) weapons design, analysis, and output codes; (3) demonstration of scalable parallel execution of a coupled geophysical fluid dynamics application code testbed on Meiko CS-2, Cray T3D, and IBM SP2-2-A mainframes; and (4) modification of 2D weapons codes to operate on scientific workstations to determine if they might be cost-effective alternatives to traditional vector supercomputers for 2D simulation.

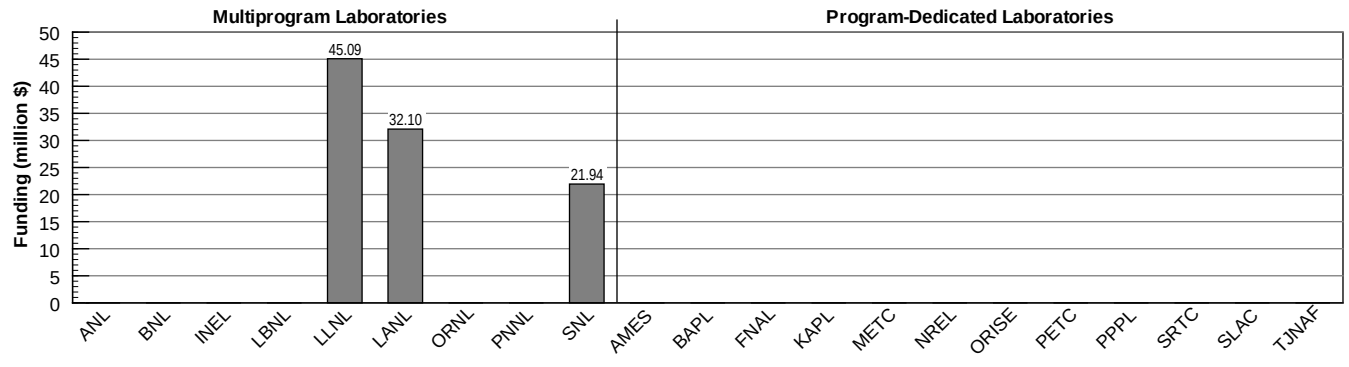
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Systems Engineering

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103231

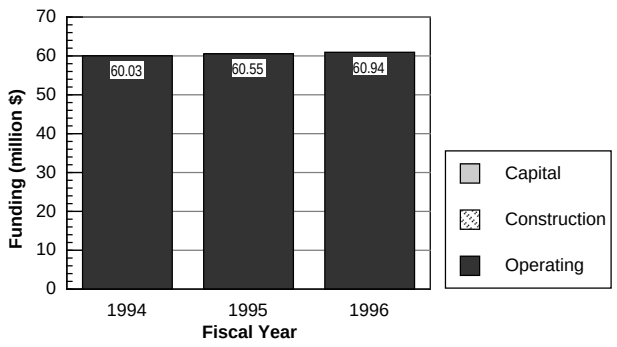
Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: LANL, LLNL

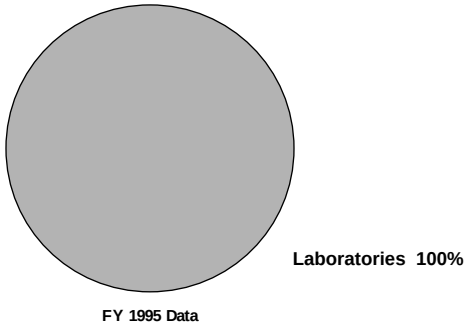
Mission Activity Description

The Department of Energy has responsibility for maintaining the safety and reliability of the Nation's nuclear weapons stockpile. The DOE Defense Programs laboratories, established to design, develop, and test nuclear weapons, play key roles in fulfilling this responsibility. The Systems Engineering element of the Core Research and Advanced Technology Program is a critical component of Science-Based Stockpile Stewardship. Systems Engineering involves efforts to integrate multiple/new technologies and to package necessary components and capabilities in the volume prescribed for a weapon system by the Department of Defense. Efforts in systems engineering include demonstration of emerging technologies and improving command and control, as well as fabrication of diagnostic instrumentation. SNL performs the majority of the Systems Engineering tasks associated with the weapons program because of its responsibility for the nonnuclear portion of the weapon system. SNL has the technology base, infrastructure, and experienced personnel required to efficiently conduct research and development in this area. Activities are divided into three broad areas: surety assessments and technology, exploratory studies and technology, and engineering and testing infrastructure. LLNL and LANL each have smaller programs in Systems Engineering. Their primary responsibilities are the physics packages, but there is some overlap with Systems Engineering. A sample of the activities conducted in the Systems Engineering program includes: (1) development of a failure analysis expert system for neutron generators; (2) validation of the nuclear detonation detection system augmentation payload for use on future global positioning system (GPS) satellites; (3) development of an inspection station for enhanced surveillance and part requalification; and (4) demonstration of the feasibility of nondestructive gap thickness in pits.

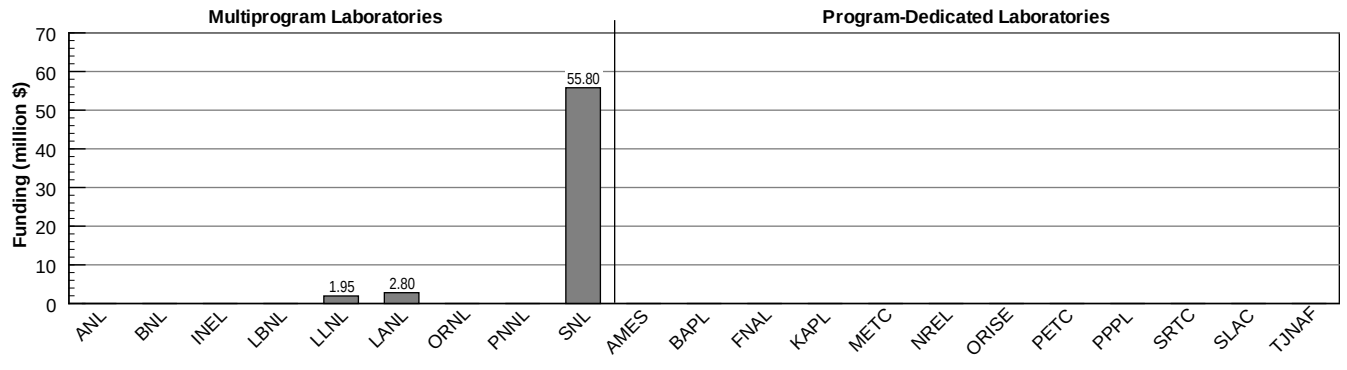
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Electronics, Photonics, Sensors, and Mechanical Components

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103232

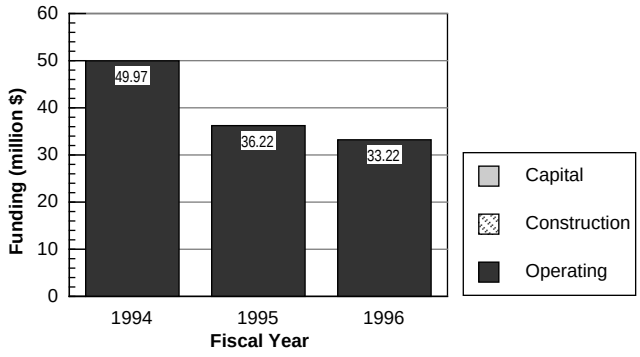
Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LLNL
Participating Laboratories: None

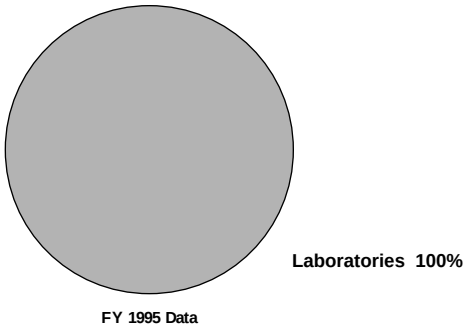
Mission Activity Description

The Department of Energy has responsibility for maintaining the safety and reliability of the Nation's nuclear weapons stockpile. The DOE Defense Programs laboratories, established to design, develop, and test nuclear weapons, play key roles in fulfilling this responsibility. The Electronics, Photonics, Sensors, and Mechanical Components activity of the Core Research and Advanced Technology Program supports Science-Based Stockpile Stewardship. Many of the requirements for electronic devices in nuclear weapon applications cannot be met with commercial products. This is also true for many of the photonic, sensor, and mechanical components. The longevity of these components plays a major role in the reliability of the weapon after an extended period of time in the stockpile. Innovations in these areas are driven by DOE defense requirements and have important life-cycle cost benefits. Research is conducted in the enabling technologies for components and subsystems that control and operate nuclear weapons, and in intelligent systems that monitor and diagnose the condition of weapons with regard to aging, functional status, intrusion or tamper detection, and anticipated performance. Emphasis is on devices used in conjunction with microelectronic systems that can offer the following: improved safety, security, reliability and information processing; improved response to abnormal environments; enhanced command and control; automated monitoring and inventory control; command disablement; and intelligent manufacturing using robotics. Activities at the laboratories are divided into ten broad areas: electronic subsystems, electronics components, packaging and interconnects, reliability and certification, photonic materials, photonic devices, photonic subsystems, mechanical components, aerodynamic components, and sensors.

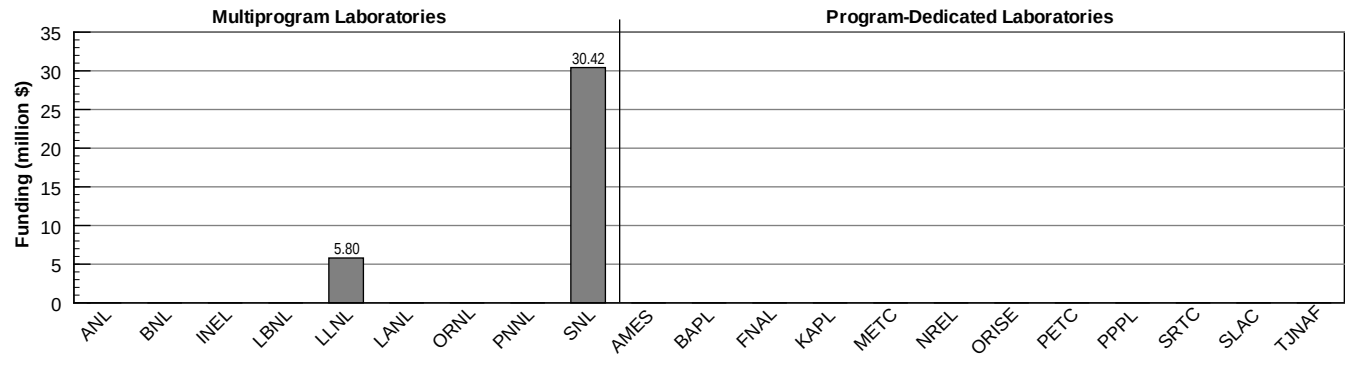
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Advanced Manufacturing Technology Development

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103233

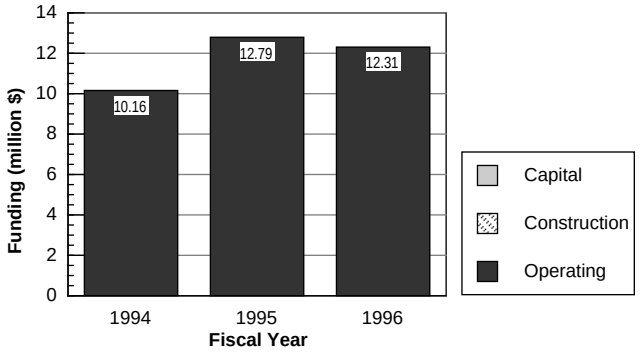
Laboratory Complex

Principal Laboratories: LANL, SNL
Contributing Laboratories: None
Participating Laboratories: LLNL

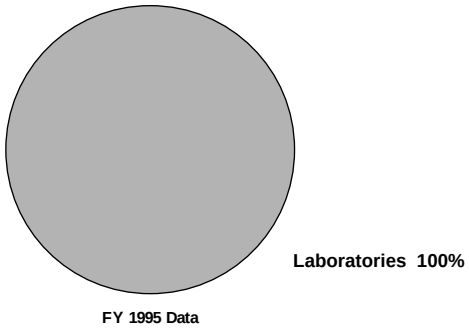
Mission Activity Description

The technical goals of the Advanced Manufacturing Technology Development activity support the Department of Energy mission of providing technical information and the scientific and educational foundation for a secure national defense. Manufacturing research expertise at the DOE weapons laboratories enables a Science-Based Stockpile Stewardship to develop a knowledge base that will support future manufacturing requirements. This knowledge base will ensure an enduring national capability to rapidly and effectively manufacture components or entire weapons. The Defense Programs laboratories will become manufacturing science and technology leaders for small lot, inherently safe, ultra-reliable systems and components by leveraging advances in chemistry and materials, engineering sciences, information sciences, and fabrication technology. This element supports the change of foundation for U.S. nuclear deterrence, from one based on capacity to one based on capability, involving reliance on a much smaller stockpile, and enhancement of the ability to produce limited numbers of remanufactured components or weapons. Efforts in this activity address the loss of the ability to replicate (due to environmental concerns, loss of vendor, etc.) the manufacturing processes that were originally used to produce systems presently in the stockpile. Component fabrication research supports the process of making small batches of components with the same quality, reliability, and performance achievable through a fully automated production line, but without the benefit of special tooling, trial runs, and a massive database of statistical evidence to track trends and adjust processes. To compensate for the lack of statistical process data during small lot production, post-process part inspection must be replaced by in-process or process intermittent gauging. Full use of in-process information requires advanced machine control technology and flexible manufacturing through the utilization of intelligent machines and robotics.

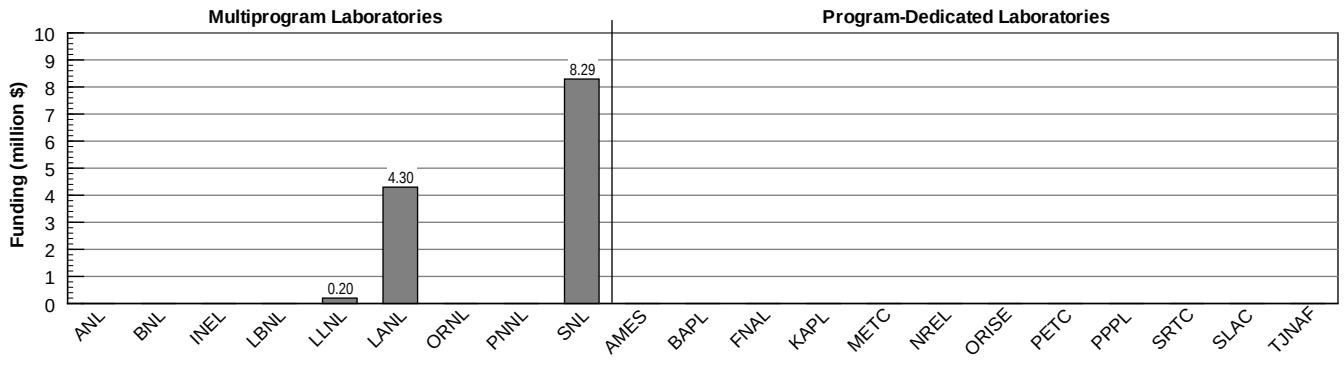
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Chemistry and Materials

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103241

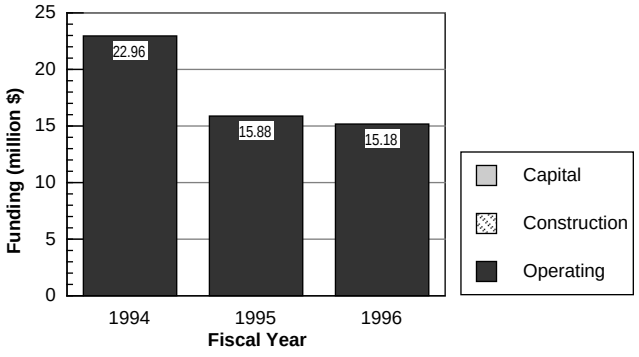
Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LANL, LLNL
Participating Laboratories: None

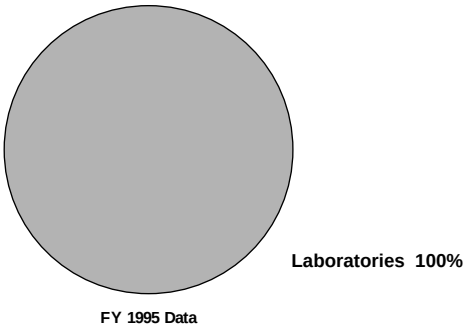
Mission Activity Description

The Department of Energy has responsibility for maintaining the safety and reliability of the Nation's nuclear weapons stockpile. The DOE Defense Programs laboratories, established to design, develop, and test nuclear weapons, play key roles in fulfilling this responsibility. Meeting the demanding reliability, safety, and physical security requirements of nuclear weapons requires a diverse range of materials expertise and capabilities. The Chemistry and Materials element of the Core Research and Development Program supports Stockpile Stewardship by conducting research in materials synthesis and processing; determining materials structure and composition; and developing functional properties in polymers, metals, ceramics, inorganic and organic materials, and composites. The safety and reliability of the enduring U.S. nuclear weapons stockpile rely directly on the results of this research to address the resolution of weapons aging and reliability issues; to support the remanufacture of stockpile components in a timely, cost-effective, and environmentally benign way; and to enhance the reliability and surety of remanufactured components. Pertinent objectives include maintenance of engineering competence in this unique set of materials science, development of models to study aging phenomena, and development of low-toxicity alternative materials to reduce environmental, safety, and health concerns associated with weapons production, maintenance, and dismantlement. Significant investment leverage is realized by the expanded chemistry and materials technologies mission, which includes working with industry to conduct research of mutual interest, working with the Department of Defense on improvement of conventional munitions, environmental cleanup, and energy research. Stockpile maintenance efforts also demand an extensive chemistry and materials technology base that requires continued investment in these areas at all three Defense Programs laboratories.

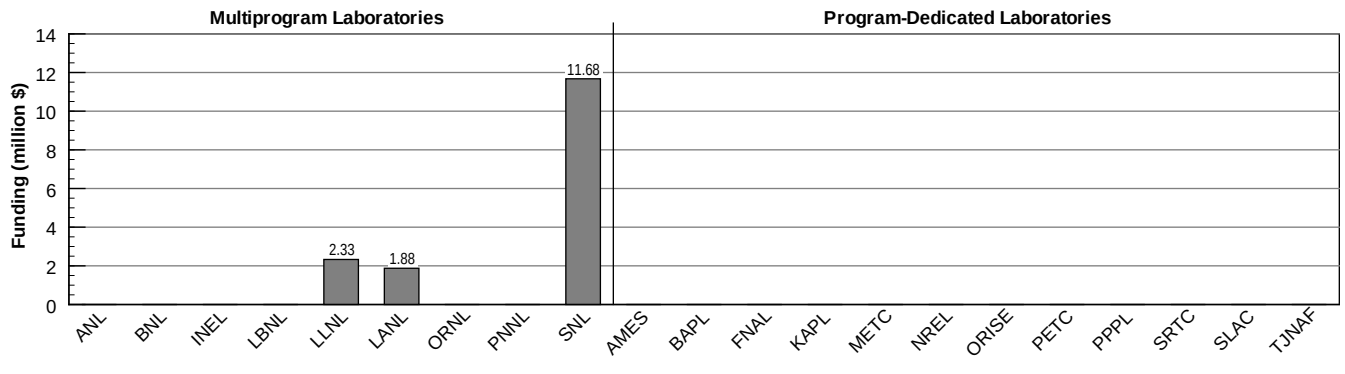
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Los Alamos Neutron Science Center

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: G30103013

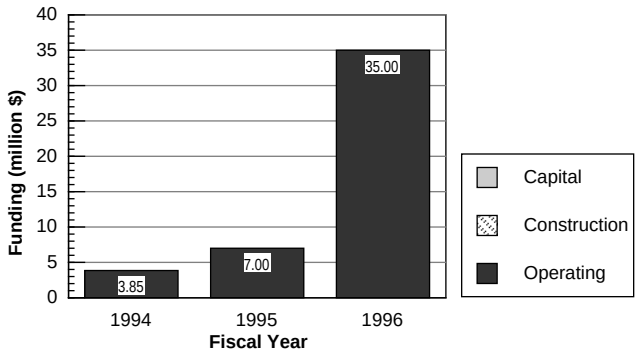
Laboratory Complex

Principal Laboratories: LANL
Contributing Laboratories: None
Participating Laboratories: None

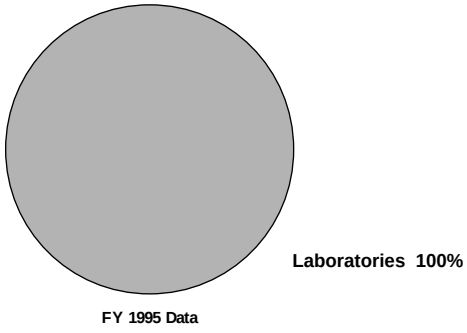
Mission Activity Description

The Department of Energy has national security as one of its primary missions. Maintenance of a safe and secure nuclear weapons stockpile is one of the major subsets of this mission. DOE will use the Defense Programs concept of Science-Based Stockpile Stewardship to achieve this mission. To understand how the increasing age of stockpiled weapons affects their safety and reliability, it is necessary to carefully examine the materials that make up these weapons. Conventional radiography methods alone will not provide the detailed information needed. The Los Alamos Neutron Science Center (LANSCE) can make a significant contribution to the safety, reliability, and longevity of the enduring U.S. nuclear weapons stockpile by providing an intense source of pulsed neutrons for use in unique and valuable probes of the structure of matter. LANSCE provides a new source of critical data for use in the detection of subatomic-scale material defects that may well serve as indicators of weapon component aging and for use in the prediction of material performance. In recognition of its importance to the national security mission, DOE ownership of LANSCE was transferred from the Office of the Assistant Secretary for Energy Research to the Office of the Assistant Secretary for Defense Programs on October 1, 1995. The following Defense Programs Science-Based Stockpile Stewardship areas will benefit from the commencement of operations at LANSCE: utilization of neutron and proton radiography for nondestructive surveillance of weapons (proton radiography is well suited to provide a complete time history of an implosion); study of weapons materials science properties, including materials textures; examination of the plutonium equation of state; measurement of material properties for nuclear forensics; characterization of damage from high-energy neutrons on National Ignition Facility final optics; and characterization of the properties of high explosives. A sample of LANSCE research activities includes: (1) demonstration of the feasibility of temperature measurements in high explosives with single pulses of resonance energy neutrons; (2) measurements aimed at characterizing material textures in stockpile return and new-process weapon components; and (3) studies of the microstructure and aging of high explosives through use of small-angle neutron scattering.

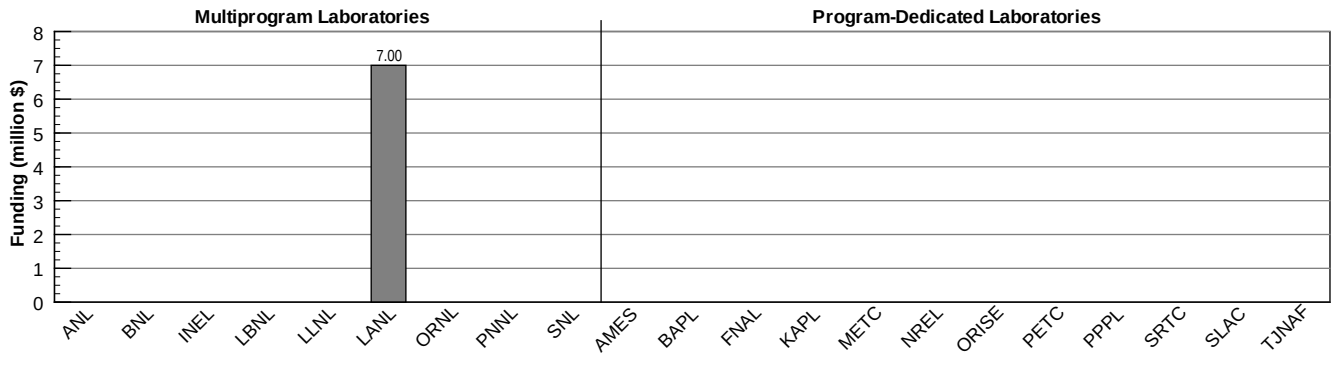
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



High Explosives

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103241

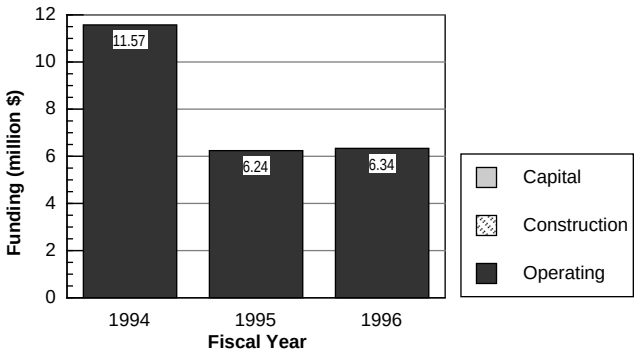
Laboratory Complex

Principal Laboratories: LANL, LLNL
Contributing Laboratories: None
Participating Laboratories: None

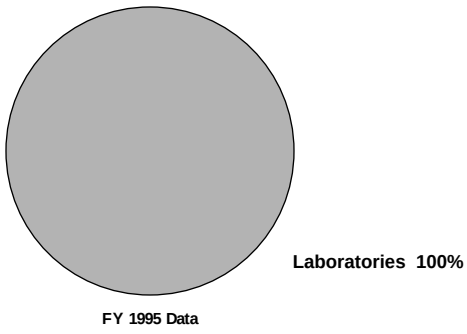
Mission Activity Description

The Department of Energy has national security as one of its primary missions, with maintenance of a safe and secure nuclear weapons stockpile as one of the major subsets of that mission. The High Explosives element of the Core Research and Advanced Technology Program supports the maintenance of a safe, secure, and reliable nuclear weapons stockpile by conducting research in energetic materials (explosives, propellants, and pyrotechnics), which are key components in nuclear weapons. Research activities involve the fundamental physics and chemistry of explosive materials, characterization and modeling of explosive properties, improvement of firing technology, investigation of demilitarization technologies, and engineering of explosive component prototypes and their evaluation for weapons use. Achieving an optimal balance between safety and performance is the major goal of these activities, which seek to provide more powerful insensitive high explosives, highly resistant to unintentional detonation; detonation systems that offer improvement in safety; and answers to questions about the effects of aging on high explosives in stockpiled weapons. Each Defense Programs laboratory has unique facilities which lend themselves to execution of this type of research in support of Science-Based Stockpile Stewardship and maintenance of energetic material core competencies (detonation physics, advanced diagnostics development, chemical synthesis, predictive code development, modeling, and aging/compatibility phenomena). A representative sample of activities includes: (1) development of a comprehensive containment vessel strategy for use with high-explosive experiments; (2) study of fundamental kinetics of molten salt destruction of energetic materials; and (3) continued efforts in the design and fabrication of the next-generation direct optical ignition firing set.

Funding History

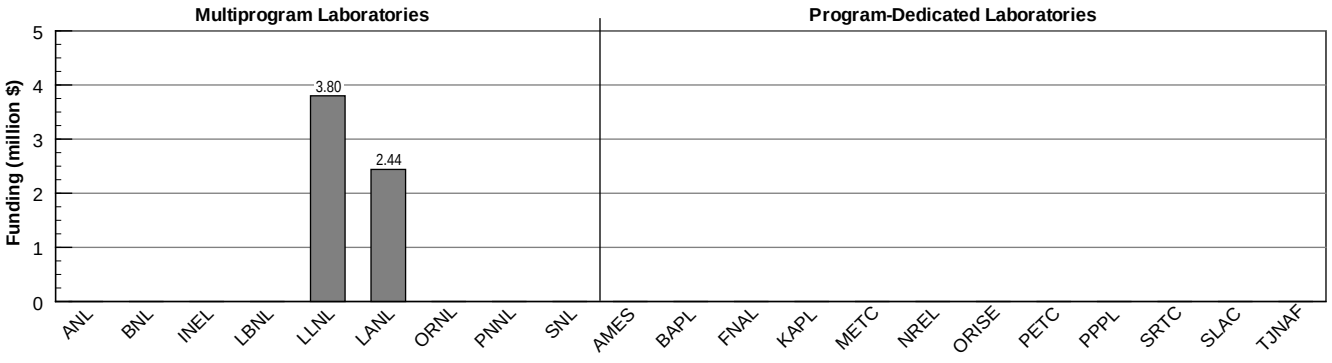


Laboratory-Academia-Industry Participation



FY 1995 Data

Fiscal Year 1995 Funding Profile



Special Nuclear Materials

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103242

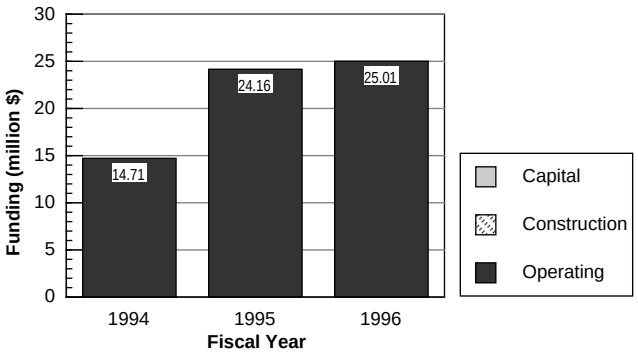
Laboratory Complex

Principal Laboratories: LANL, LLNL
Contributing Laboratories: None
Participating Laboratories: None

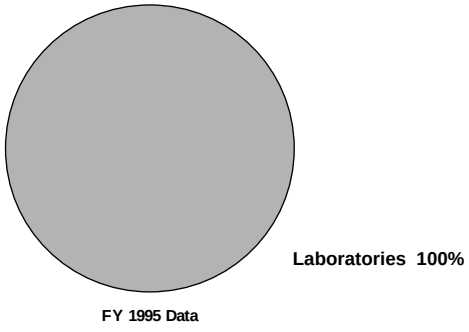
Mission Activity Description

The Department of Energy has national security as one of its primary missions. The Special Nuclear Materials element of the Core Research and Advanced Technology Program plays a key role in this mission by contributing to the safety and reliability of the U.S. nuclear weapons stockpile. This element's research is concerned with advanced and automated processing, casting, dynamic testing, and machining technologies for lithium salts, plutonium, and uranium. It supports an enhanced understanding of the physical, mechanical, chemical, and thermodynamic properties of the actinides. Understanding these properties is fundamental to the development of environmentally benign fabrication, handling, and storage capabilities for special nuclear materials—a critical research area because most special nuclear materials are chemically very reactive, as well as highly radioactive, and require specialized technical expertise and costly facilities to accommodate handling and processing. The U.S. capabilities in these areas, including essential expertise in manufacturing, purification, recycling, and waste management, reside principally within the Defense Programs nuclear weapons complex. Research undertaken in this program element supports continued evolution and maintenance of competencies in this technology area. Treaty agreements, changing stockpile policies, and tighter environmental safety and health regulations have shifted the priorities of this program from production to support of the existing stockpile and disassembly activities. Emphasis is currently being placed on recycling procedures, aging effects, precision casting, dry machining, robotic handling, and improved treatment of hazardous by-products and waste. Unique aspects of special nuclear materials technology demand the processing and use of these materials with full regard for worker and environmental safety and health, cost control, nuclear material and waste management considerations, accurate materials accountability, and safeguards and security.

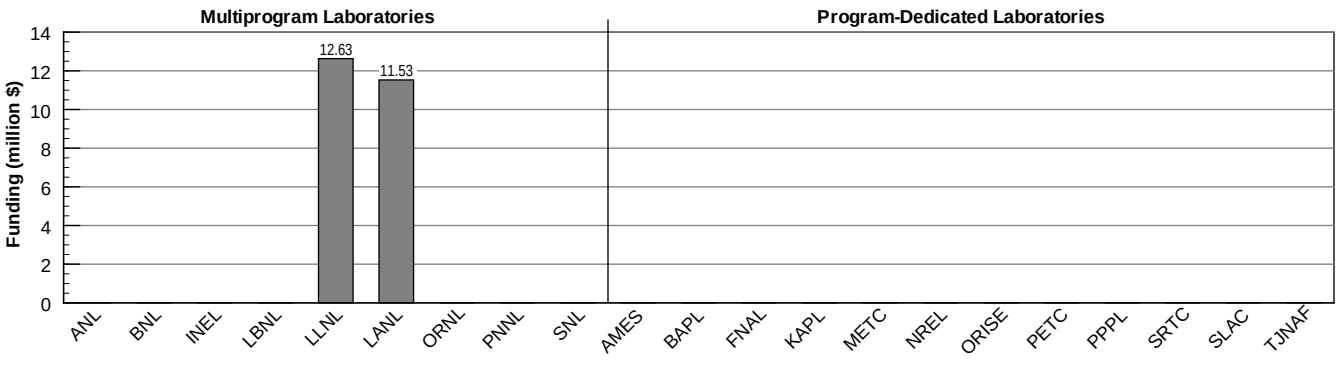
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Tritium

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0103243

Laboratory Complex

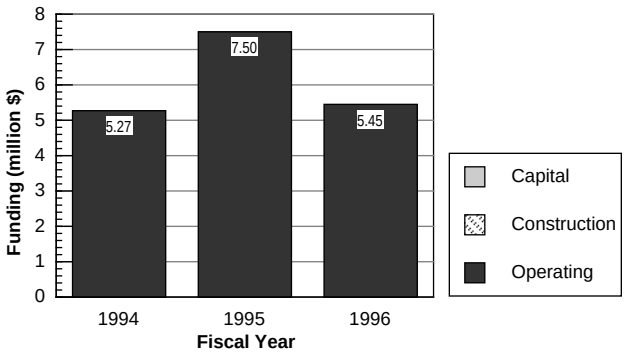
Principal Laboratories: LANL
Contributing Laboratories: LLNL
Participating Laboratories: None

Mission Activity Description

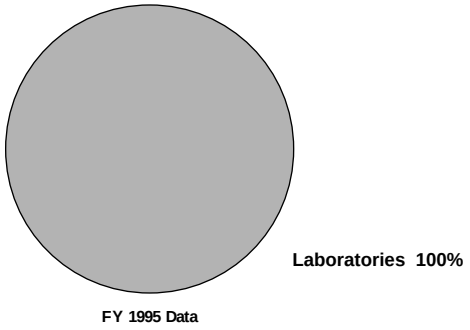
Tritium-related research directly affects the safety and reliability of the U.S. nuclear weapons stockpile. Many modern nuclear weapons use this radioactive isotope to enhance their yield. Additionally, tritium has been proposed as a fuel for inertial fusion targets. Tritium has a short radioactive half life, requiring periodic replenishment in the weapon systems utilizing it. Replenishment is complicated by tritium's high chemical reactivity and environmental safety and health concerns. Maintenance of the nuclear weapons stockpile as directed by the President in the Nuclear Weapon Stockpile Memorandum will require expertise in the use of tritium as long as stockpiled weapons utilize this isotope.

The Tritium element of the Core Research and Advanced Technology Program, a subset of the Defense Programs Science-Based Stockpile Stewardship Program, covers material science research in the production, handling, and use of tritium and its compatibility with other materials and components. There are currently four broad areas of study in this program element: gas transfer systems, solid storage systems, neutron generator tubes, and inertial fusion targets. As tritium decays, it can cause degradation of the performance of a weapon system's physics package, reducing its stockpile life. A sample of tritium research activities includes: (1) successful operation of a new economical tritium gathering system that avoids creation of tritiated water during contamination clean up operations and (2) design and construction of a boost system loading manifold at the Weapons Engineering Tritium Facility (WETF)

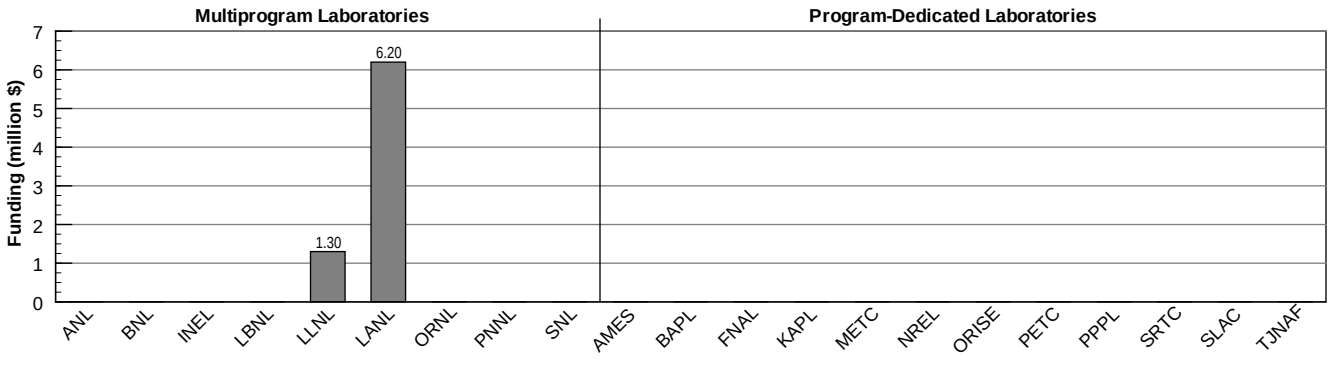
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Indirect Drive With Glass Laser Driver

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0207

Laboratory Complex

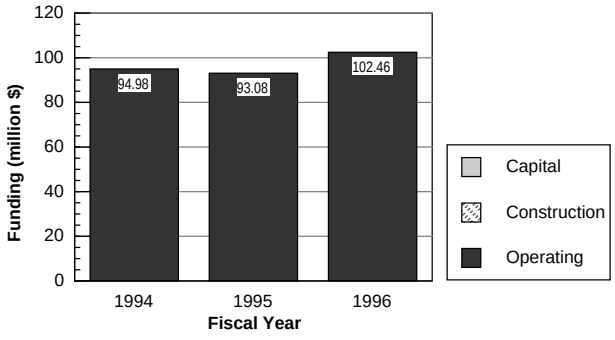
Principal Laboratories: LLNL
Contributing Laboratories: LANL
Participating Laboratories: None

Mission Activity Description

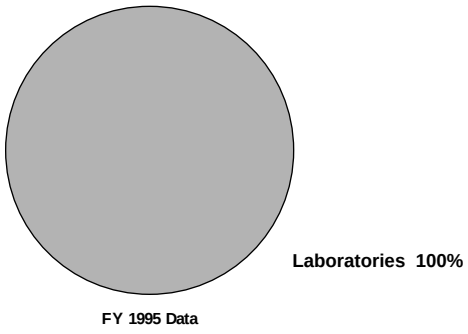
DOE is responsible for continuously keeping the U.S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. DOE has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

The Indirect Drive with Glass Laser activity supports the maintenance of a safe, reliable U.S. nuclear weapons stockpile by providing the capability to perform weapon physics experiments and computations to increase the level of confidence in achieving ignition in the laboratory and to provide support for the National Ignition Facility (NIF) project. This task includes computational and experimental efforts to investigate the x-ray-driven (indirect drive) approach to ICF. Indirect drive with the glass laser driver is the mainline approach to ICF and is pursued at LLNL with the 10-beam Nova laser and at LANL using the smaller Trident laser facility. This program has already made important contributions to the Science-Based Stockpile Stewardship Program by providing the experimental and computational capability to measure opacity and equation-of-state parameters of high-energy-density plasmas (crucial information for the understanding of thermonuclear weapon performance). The NIF design is based on this driver technology.

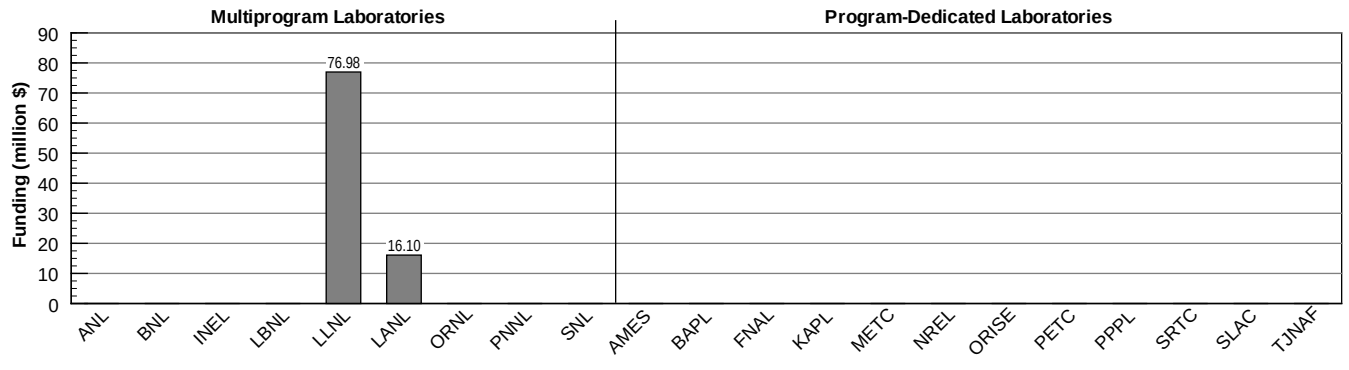
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Direct Drive With Glass Laser Driver

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0208

Laboratory Complex

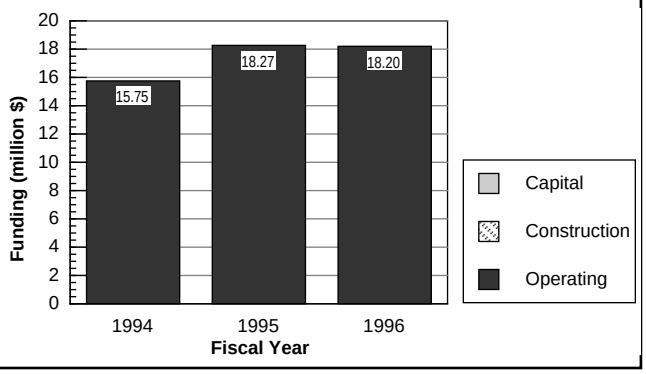
Principal Laboratories: UR/LLE
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

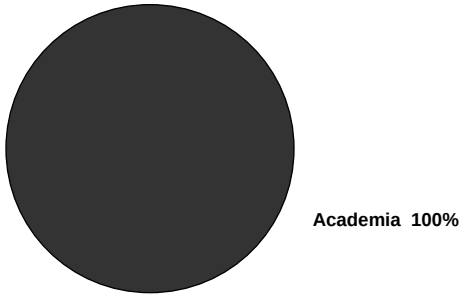
DOE is responsible for continuously keeping the U.S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. DOE has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

The Direct Drive with Glass Laser activity supports the Science-Based Stockpile Stewardship Program in providing a technical alternative to indirect drive. It utilizes Omega, the highest power laser with the best optical quality available, for performing high-energy-density experiments which can be used to assess the viability of direct drive for the National Ignition Facility (NIF). This approach to ICF is complementary to the indirect-drive approach and may prove to be more efficient than the indirect-drive option. The direct-drive approach to ICF can potentially provide higher gain for the same driver energy as the indirect-drive approach. The Omega facility, which is built to use the direct-drive concept, will also become the test bed for many NIF-related experiments, as well as for investigating pulse shaping and bandwidth requirements. Weapons physics scientists will increasingly rely on Omega until the NIF is available. The educational and outreach function at the University of Rochester Laboratory for Laser Energetics (UR/LLE) will make available highly competent, skilled scientists for the ICF program and the weapons program in support of the national security mission. Currently, scientists trained at UR/LLE play important roles in the LLNL laser technology development program, in Nova experiments, and on the NIF design team.

Funding History



Laboratory-Academia-Industry Participation



FY 1995 Data

Note: All funding goes to University of Rochester.

Fiscal Year 1995 Funding Profile

No DOE laboratory funding

Krypton Fluoride Laser

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0209

Laboratory Complex

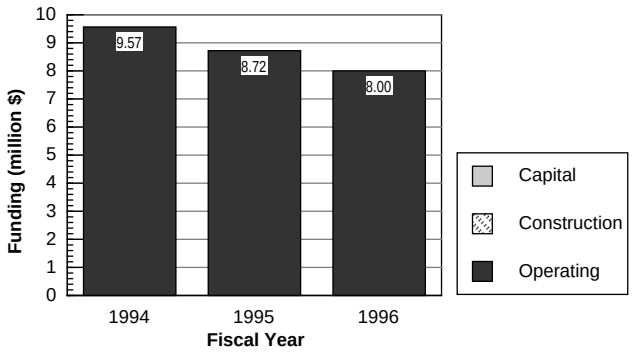
Principal Laboratories: LANL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

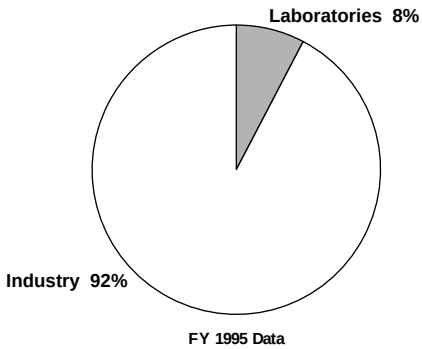
DOE is responsible for continuously keeping the U.S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. DOE has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

The krypton fluoride (KrF) laser is a short-wavelength laser with enhanced beam uniformity and efficiency. With ultra-smooth broad-bandwidth beams, research utilizing the Nike KrF laser at the Naval Research Laboratory (NRL) supports the maintenance of a safe and reliable U.S. nuclear deterrent by providing a unique capability for measuring hydrodynamic instability and mixing, an important phenomenon in ICF and weapons performance. Laser experiments on the Nike laser concentrate on acceleration of planar targets on a low isentrope to define beam smoothness requirements for direct drive. Of immediate importance to the National Ignition Facility (NIF) design and the Science-Based Stockpile Stewardship Program are Nike's near-term capability for flat target studies of imprinting and bandwidth effects on targets. Research at NRL provides critical innovations for enhancement of laser driver performance and capabilities in code development and atomic physics, both essential to the mission of ICF. KrF laser technology may be extrapolated to a fusion reactor scenario because it can be repetitively pulsed and it is relatively efficient.

Funding History



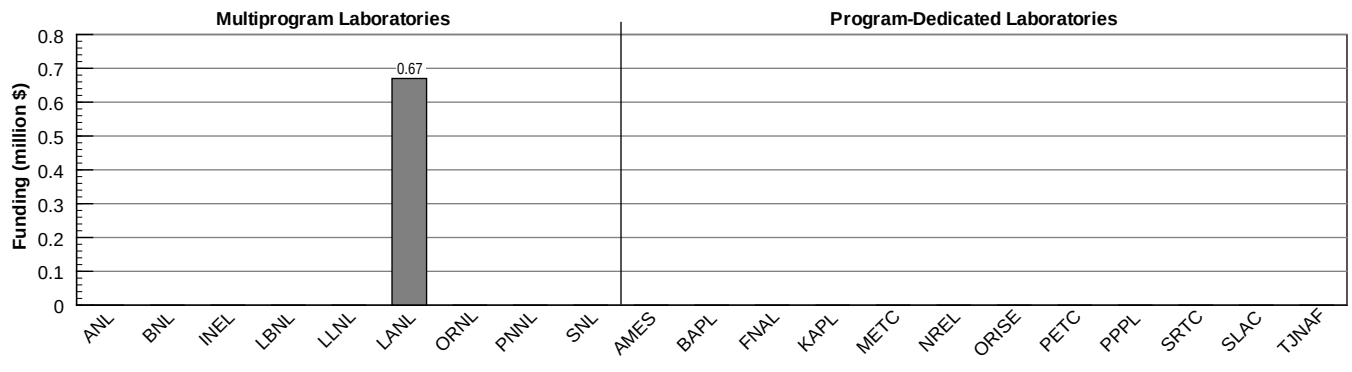
Laboratory-Academia-Industry Participation



FY 1995 Data

Note: NRL funds are included in industry partition. Industry partition also includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Light Ion Beams

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0210

Laboratory Complex

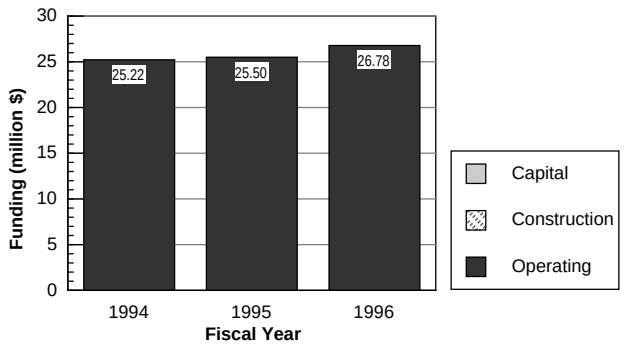
Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

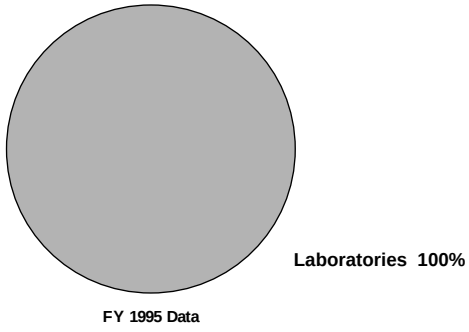
DOE is responsible for continuously keeping the U.S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. The Department of Energy has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

The Light-Ion Beams activity contributes to the ICF mission through its work on ion beams in support of an eventual high-yield capability; through the availability of ICF-developed facilities for radiography and for production of intensely radiating z-pinch plasmas that are used for both nuclear weapon effects testing and large-scale hohlraum experiments; and through direct support for National Ignition Facility (NIF) development. In the light-ion approach to ICF, electrical energy from a pulsed-power accelerator is coupled to a magnetically insulated diode to create an intense beam of light ions that can be focused onto a target. The principal facility for light-ion experiments is the Particle Beam Fusion Accelerator II (PBFA II) pulsed-power accelerator at SNL. Pulsed-power technology is being pursued as possibly the best approach to high target gain because of its efficiency, relatively low cost, and favorable energy deposition characteristics. Z- pinch experiments conducted and code development undertaken, including 3-dimensional hydrodynamics and particle-in-cell codes, are expected to provide important data for the NIF and for weapon science, in direct support of the ICF mission.

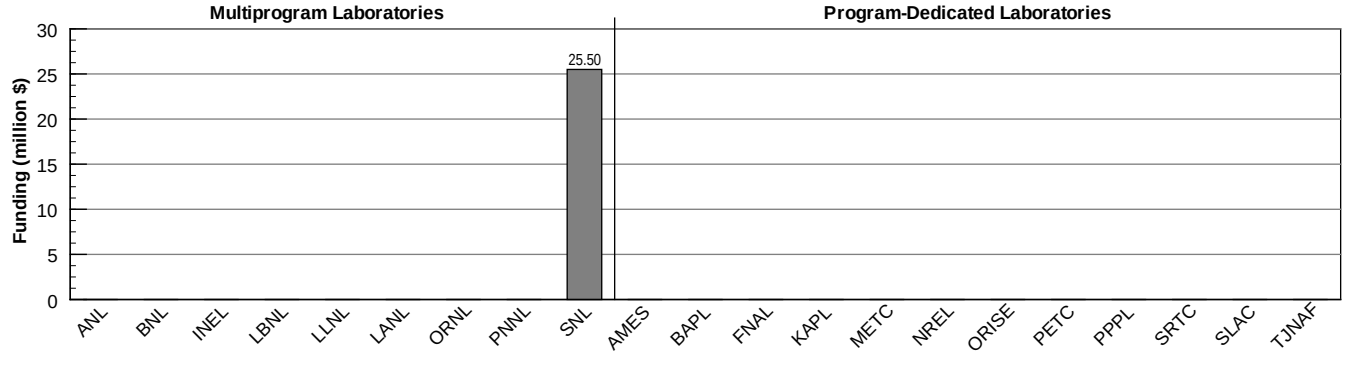
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Capsule Fabrication and Development

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB0211

Laboratory Complex

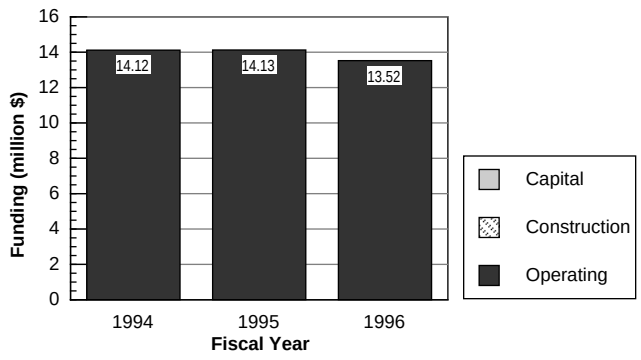
Principal Laboratories: LANL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

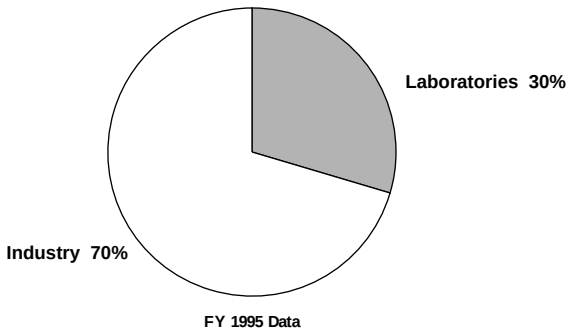
DOE is responsible for continuously keeping the U. S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. DOE has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

Capsule fabrication and development is essential to the ICF program and maintenance of the U.S. nuclear weapons stockpile. This program seeks to develop and assemble ignition targets and the associated cryogenic technologies and systems for the ICF program and National Ignition Facility (NIF) support. Research efforts include the development, manufacture, and metrology of various complex, well-characterized, indirect- and direct-drive targets and target components. An ignition target consists of a millimeter-scale, fuel-containing spherical capsule which (for indirect drive) may be enclosed in a vacuum- or gas-filled radiation case called a “hohlraum”, mounted with a low-mass fiber web, or mounted in a low- density foam-filled hohlraum. Ignition target designs require cryogenic fuel in the capsules. Technological challenges include producing capsules with cryogenic layers of sufficient smoothness and uniformity, maintaining targets at cryogenic temperature during transportation to the center of an evacuated target chamber, and performing final alignment. Achievement of target fabrication goals, especially in the area of cryogenic targets, is critical to achieving thermonuclear ignition and burn in the laboratory.

Funding History

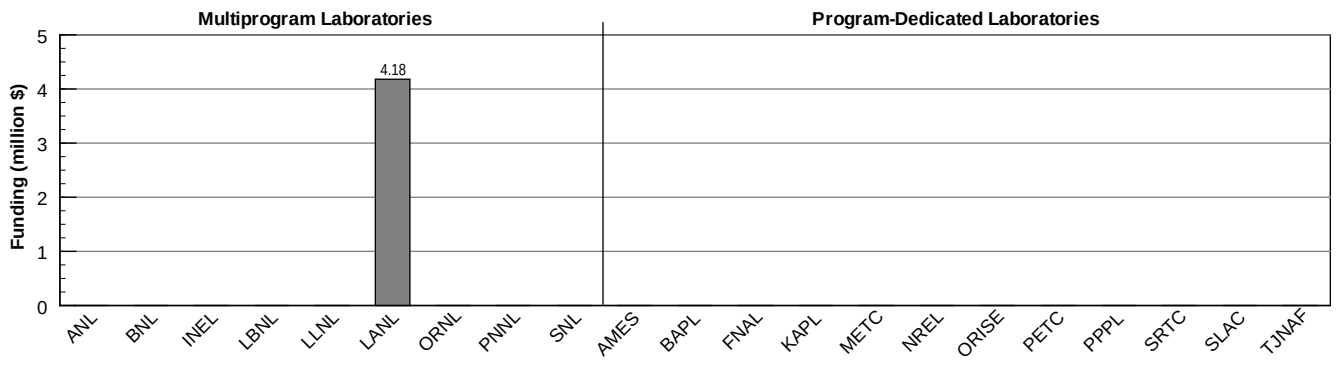


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



National Ignition Facility

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Research and Inertial Fusion
B&R Code: GB021202

Laboratory Complex

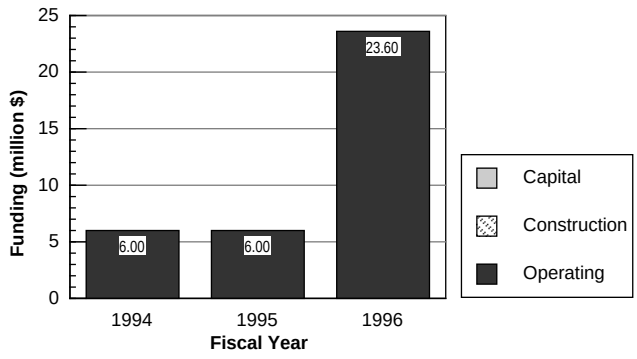
Principal Laboratories: LLNL
Contributing Laboratories: ANL
Participating Laboratories: LANL, SNL

Mission Activity Description

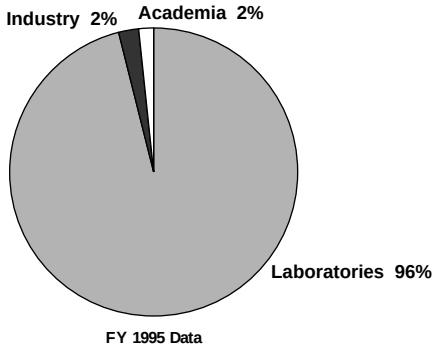
DOE is responsible for continuously keeping the U.S. nuclear weapons stockpile safe and reliable. One of the areas of weapons physics that is least well understood is the fusion reaction. Without the ability to perform underground nuclear tests, fundamental understanding of the fusion reaction becomes critical. Only inertial confinement fusion (ICF) appears to be able to provide the conditions of temperature, density, and time necessary to cause fusion in a laboratory setting. DOE has been investigating this area for many years and has determined three major approaches bear the most promise: glass lasers (direct and indirect drive), gas (krypton fluoride) lasers, and light ion beams. Glass lasers are the most well understood, but the other technologies hold great promise for future fusion facilities.

Recent high-level technical reviews by the National Academy of Sciences and the Inertial Confinement Fusion Advisory Committee strongly support the role of the National Ignition Facility (NIF) as "the most scientifically valuable of the programs proposed for Science-Based Stockpile Stewardship." The NIF will duplicate experimental conditions that approach those found in a weapon's secondary package during detonation. In the past, these conditions were attainable only through underground testing. Activities in this category include conceptual and advanced conceptual design, environmental documentation, vendor facilitization and pilot production, start-up, operational readiness reviews, and technical support as reflected in the NIF construction data sheet. The most immediate application of the NIF, once construction is complete, will be the gathering of data on high-energy-density phenomena that are relevant to similar phenomena associated with nuclear weapons. The NIF will also provide an important capability for weapon effects simulations.

Funding History

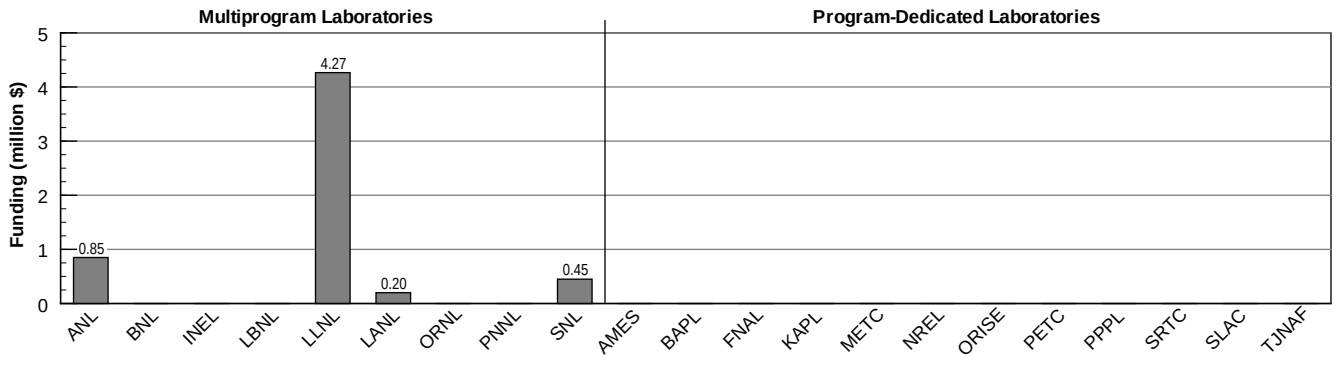


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Technology Transfer

Department of Energy Program

Program: Defense Programs
Office: Research and Development
Element: Technology Transfer
B&R Code: GB0106

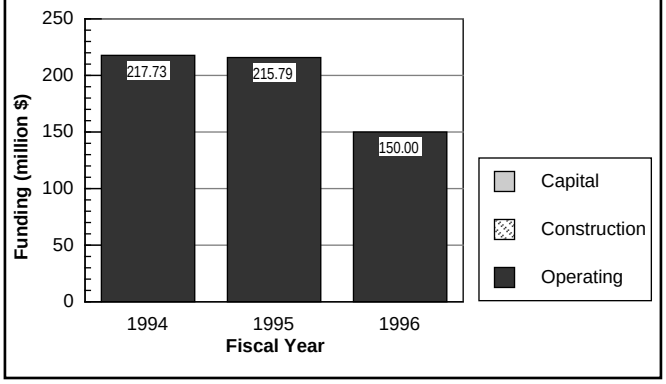
Laboratory Complex

Principal Laboratories: SNL, LANL, LLNL
Contributing Laboratories: ORNL
Participating Laboratories: ANL, INEL

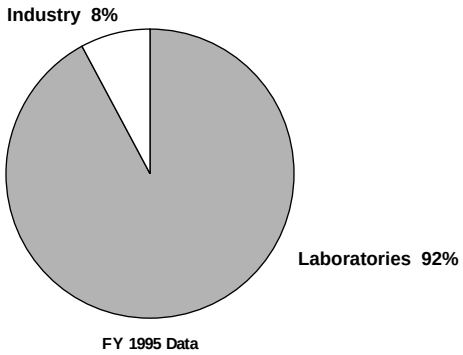
Mission Activity Description

The private sector and the Department of Energy share many of the same research and technology interests. Additionally, the private sector is an integral part of the weapons program as a supplier of many weapons components. The Technology Transfer activity supports the mission of the Department of Energy's Defense Programs (DP) by performing joint research between industry and the National Laboratories that best utilizes the strengths of each. These synergistic agreements allow the Department to cost-effectively work on issues of interest to DP, particularly those that support the weapons program, while simultaneously benefiting American industry. Some of the major areas being supported include: Agile Manufacturing, National Information Infrastructure, Machine Tool Program, High Performance Computing Program, and Integrated Circuit Fabrication and Packaging. Within each of these areas, one or more of the laboratories with a mission requirement in that area have ongoing projects with industry. Due to the tremendous number of projects, they cannot all be listed; some examples are the following: (1) the use of supercomputers to analyze a residual oil hydroprocessing unit including analysis of multiphase, turbulent, interpenetrating flows to increase understanding of their behavior in both chemical reactors and in weapon physics; (2) the Technologies Enabling Agile Manufacturing (TEAM) effort to enable U.S. industry to manufacture high-quality replacement parts for the weapons program with a minimum of costly certification; and (3) the development of accurate computer simulation of machining processes to benefit the industrial partner's metal-cutting techniques and the operations required for machining of plutonium, beryllium, and uranium components.

Funding History

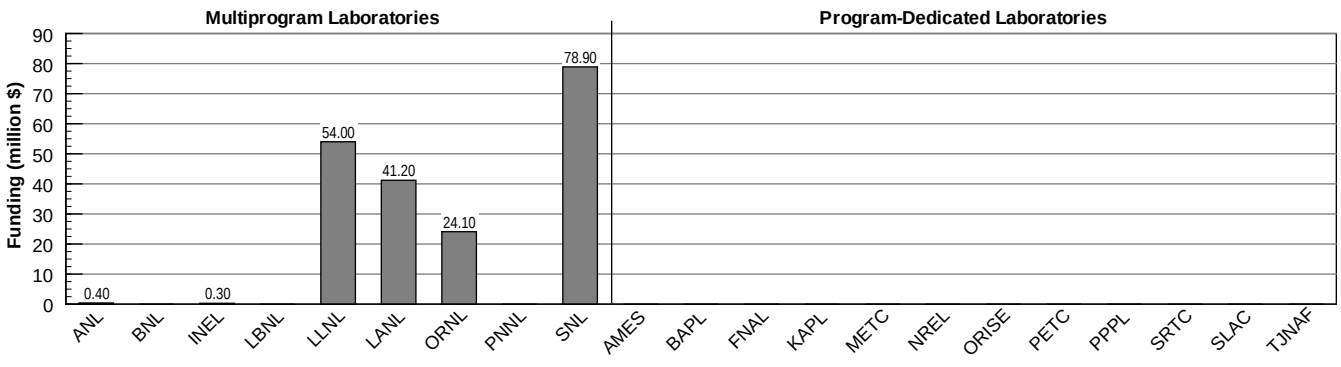


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



War Reserve New Production

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Management
Element: War Reserve New Production
B&R Code: GB031001

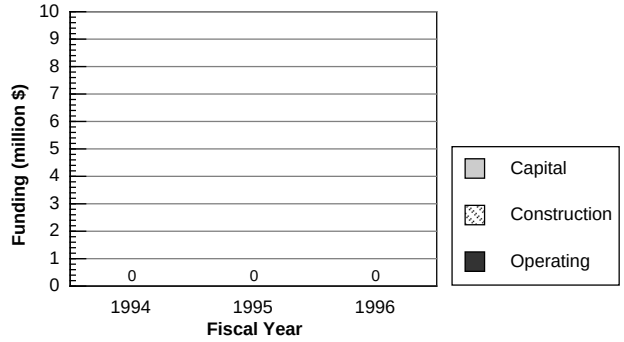
Laboratory Complex

Principal Laboratories: None
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

Even though the United States has halted production of new nuclear weapons and is reducing the size of its existing nuclear weapons stockpile, it still needs to retain the capability to produce weapons components. The newly manufactured weapons parts will be needed in the enduring stockpile to replace those that are destroyed during stockpile evaluation tests. War Reserve new production also includes activities to procure, fabricate, stage, and assemble materials, piece parts, and components that will be used to fulfill Presidential Decision Directive requirements for completed War Reserve weapons stockpile items.

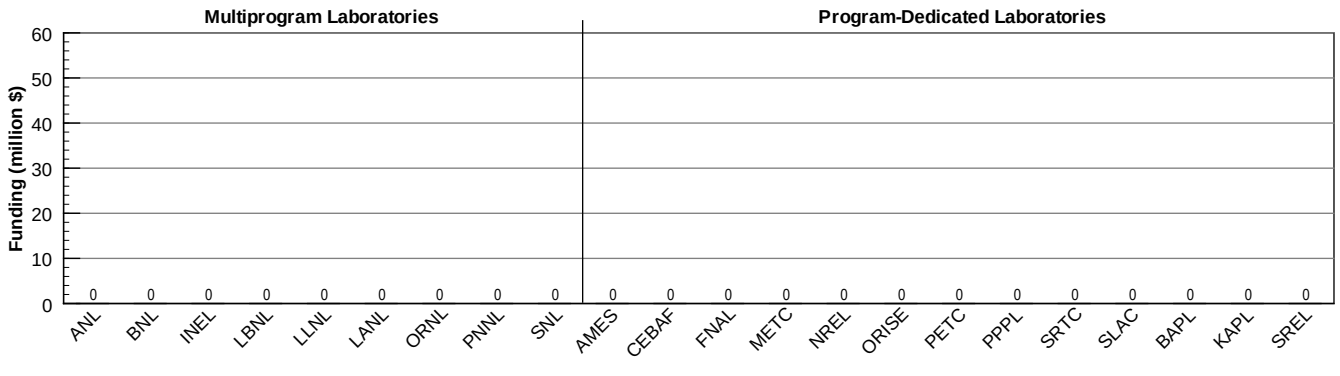
Funding History



Laboratory-Academia-Industry Participation

No current distribution available

Fiscal Year 1995 Funding Profile



Weapons Program

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Management
Element: Stockpile Management
B&R Code: GB031002

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LANL, LLNL
Participating Laboratories: None

Mission Activity Description

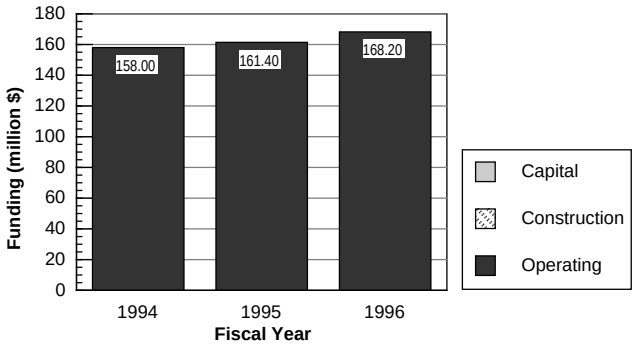
The U.S. nuclear deterrent forms a cornerstone of national security policy. DOE is responsible for keeping the U.S. nuclear weapons stockpile safe and reliable. The Weapons Program includes the direct activities at the Defense Programs laboratories and production facilities necessary to meet all directive schedules for Stockpile Maintenance, Stockpile Evaluation, and Dismantlement. It does not include research and development work performed in these areas. That work is supported by Stockpile Stewardship funds.

Stockpile Maintenance efforts keep the nuclear weapons in the enduring stockpile at the highest level of safety and security. Activities include limited life component exchange, maintenance, scheduled modifications and repairs, staging of materials awaiting processing, retrofit activities, and unscheduled weapon systems support for the enduring stockpile.

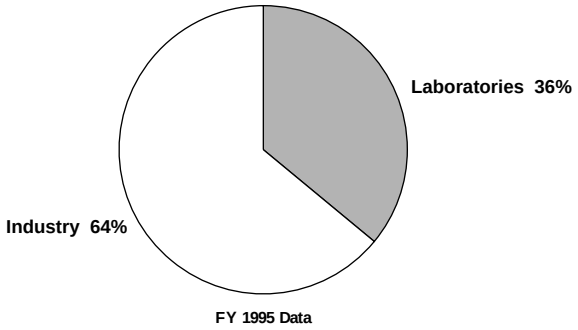
Stockpile Evaluation activities assess the quality of nuclear weapons and components in the enduring war reserve stockpile and the products delivered to the stockpile. A rigorous reliability assessment program is required to continually evaluate and determine that nuclear weapons in the stockpile are maintained according to design specifications. Evaluation concerns the understanding of quality, reliability, surety, and revalidation of weapons and components in the existing stockpile. Activities include new material laboratory tests, new material flight tests, stockpile laboratory tests, stockpile flight tests, quality evaluations, special testing, technical services, and all surveillance testing (that is, shelf-life programs, detonator samples, accelerated core, and historical sampling).

Dismantlement includes activities for weapons associated with retirement, disassembly, component characterization, and disposal and reclamation of materials and components; the engineering, development, testing, certification, procurement, and refurbishment of containers required for interim storage; and the staging and storage of weapons, components, and materials awaiting dismantlement.

Funding History

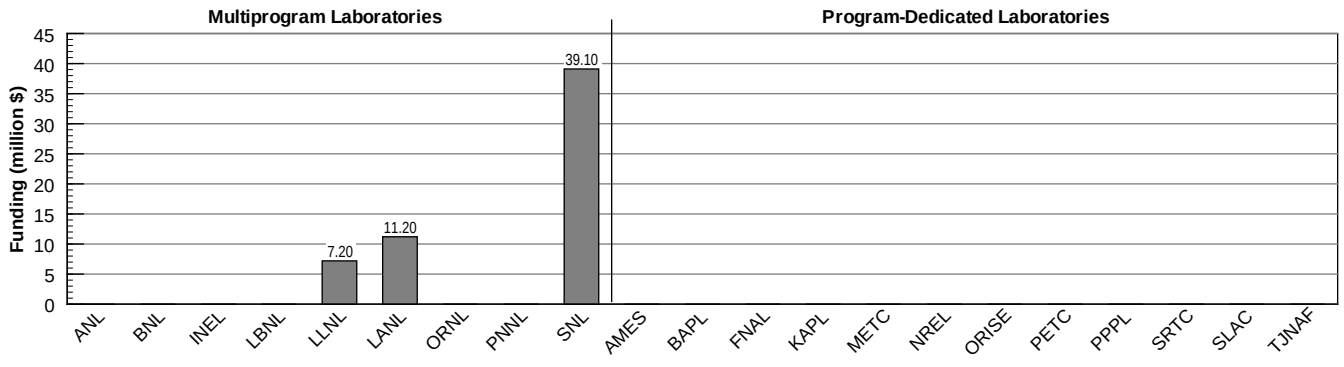


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Materials Recycle and Recovery

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Management
Element: Stockpile Management
B&R Code: GB031005

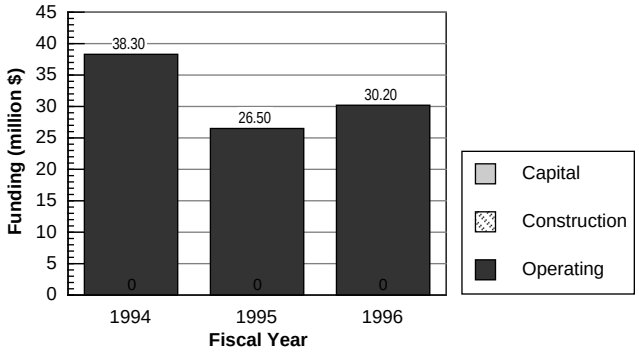
Laboratory Complex

Principal Laboratories: LANL, LLNL
Contributing Laboratories: None
Participating Laboratories: None

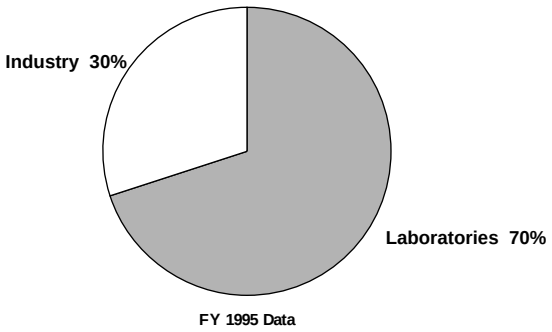
Mission Activity Description

Possessing a credible nuclear deterrent is a vital part of the U.S. national security strategy. The Department of Energy is responsible for ensuring the safety and security of the nuclear weapons stockpile. As a consequence of weapons production, maintenance, assessment, dismantlement, and disposal operations, material is produced that must be returned to the system. Activities associated with the Materials Recycle and Recovery activity include recycle and recovery of plutonium, enriched uranium, and tritium from fabrication and assembly operations, limited life components, and dismantlement of weapons and components. It also involves the process of recycling and purifying the above materials to meet specifications for safe, secure, and environmentally acceptable storage. In addition, this program includes development and implementation of new plutonium and uranium processes or improvements to existing processes for fabrication and recovery operations, and for material stabilization, conversion, and storage. These activities are largely conducted at two of the production sites, namely Savannah River, and Y-12, with some additional work occurring at Los Alamos National Laboratory.

Funding History

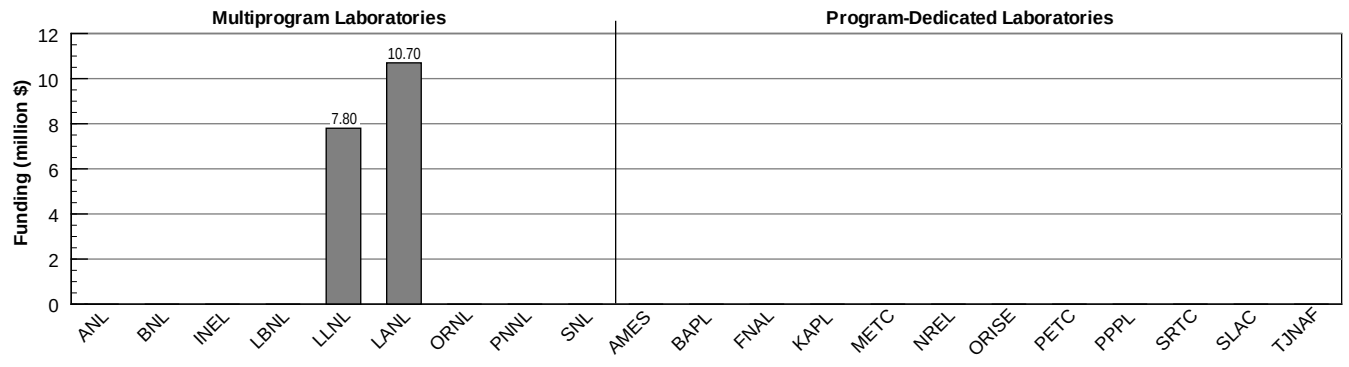


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Production Capability Assurance

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Management
Element: Stockpile Management
B&R Code: GB031301

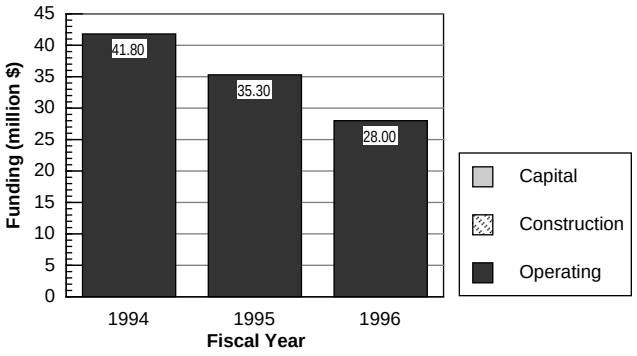
Laboratory Complex

Principal Laboratories: None
Contributing Laboratories: None
Participating Laboratories: None

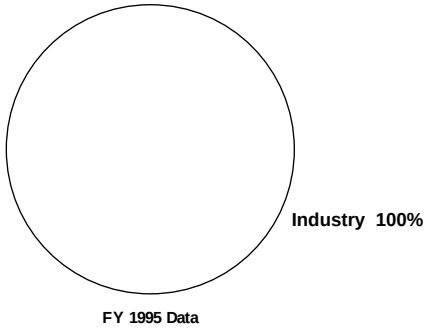
Mission Activity Description

Although the United States is no longer manufacturing new nuclear weapons, the Department of Energy still has a requirement to maintain the capability to manufacture new weapons as well as maintain a capability to "ramp up" to higher production rates if required. A basic capability to manufacture weapons to replace those removed from the enduring stockpile is required. The Production Capability Assurance activity is designed to maintain long-term competence in key manufacturing technologies and processes that are needed to ensure the viability of the enduring stockpile. This includes rebuilding enduring stockpile components, as well as developing and demonstrating components, subassemblies, and assemblies that could be used to upgrade the safety, security, and reliability of the enduring stockpile. Efforts are focused on maintaining a viable nuclear capability in the absence of explicit Department of Defense requirements for the production or retrofit of nuclear weapons. This activity supports development efforts to facilitate standardization, implementation of modern principles in design and manufacturing, process improvements, and materials capabilities to improve the baseline production and surveillance processes. Also, support is provided to technology development activities to eliminate or minimize waste generation and workplace hazards anticipated from performance of assigned missions. Some activities associated with this program are the following: (1) advanced manufacturing and plant operations support for robotics; (2) maintaining assurance of capability in beryllium technologies; (3) special cleaning, forming simulation, friction welding of dissimilar metals; (4) maintaining detonator and detonator powder manufacturing capabilities; and (5) optically initiated actuator design and manufacturing.

Funding History

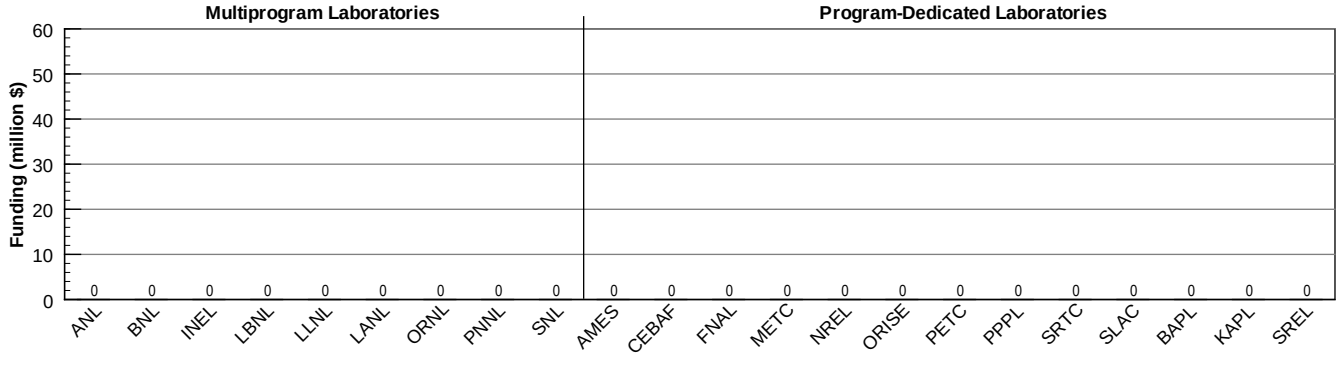


Laboratory-Academia-Industry Participation



Note: Industry partition includes nuclear weapons complex production facilities as applicable.

Fiscal Year 1995 Funding Profile



Nuclear Emergency Search Team

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Support
Element: Emergency Response
B&R Code: GB010305

Laboratory Complex

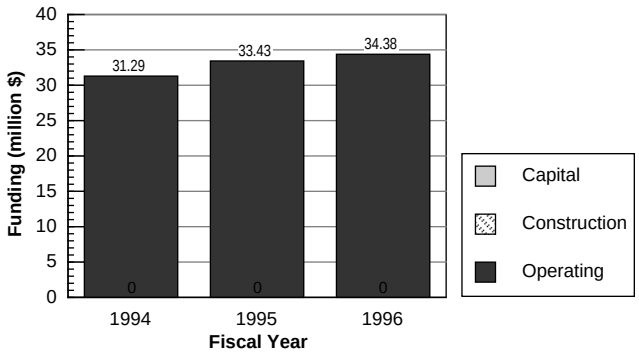
Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

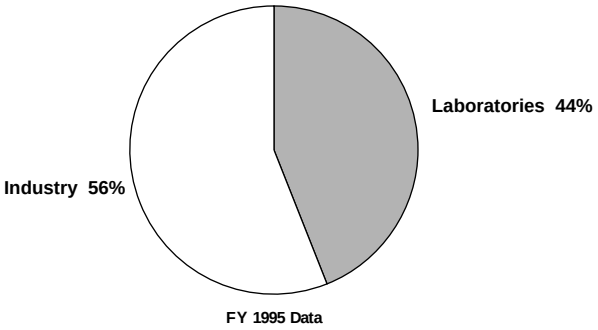
The United States requires the capability to deal with nuclear accidents and nuclear incidents worldwide. The Department of Energy, due to its expertise in managing the nuclear weapons stockpile, possesses the knowledge and national technical capabilities necessary to deal with such contingencies. The Department of Energy's major radiological Emergency Response assets and capabilities are consolidated under the Deputy Assistant Secretary for Military Application and Stockpile Support, which provides overall program management and the organizational structure during both emergency and non-emergency conditions for the personnel, equipment, and activities that collectively compose the program.

The Nuclear Emergency Search Team (NEST) consists of engineers, scientists, and other technical specialists from DOE's national laboratories and other contractors who support the nuclear weapons complex. NEST is prepared to respond within 4 hours of notification with specially trained teams and specialized equipment to assist the FBI in addressing nuclear or radiological threats. Deployable NEST assets include intelligence, communications, search, assessment, access, diagnostics, disablement, operations, containment/damage limitations, logistics, and health physics capabilities. A significant size cadre (approximately 200) of trained search personnel and specialized radiation detection systems are available to search for ionizing radiation-producing materials and are part of the NEST capability.

Funding History

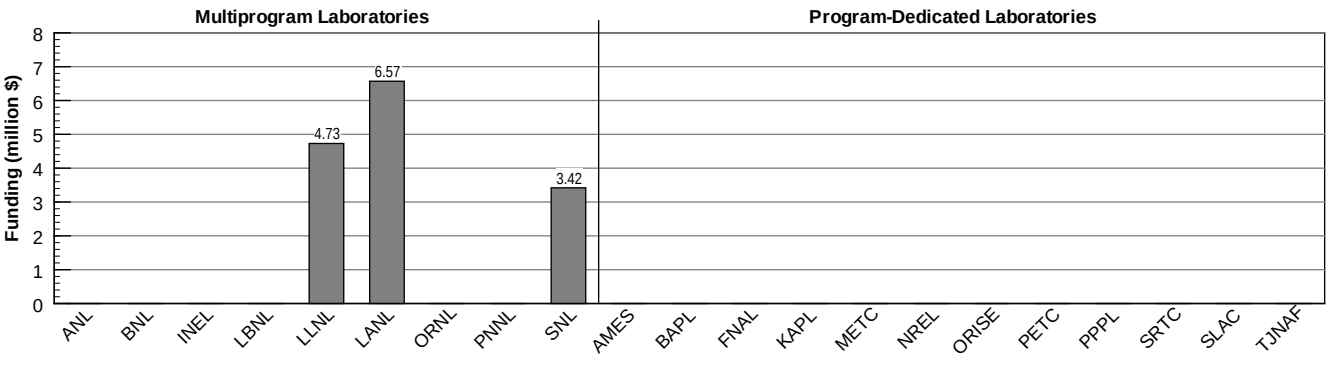


Laboratory-Academia-Industry Participation



Note: Industry partition includes the weapons production complex.

Fiscal Year 1995 Funding Profile



Accident Response Group

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Support
Element: Emergency Response
B&R Code: GB010307

Laboratory Complex

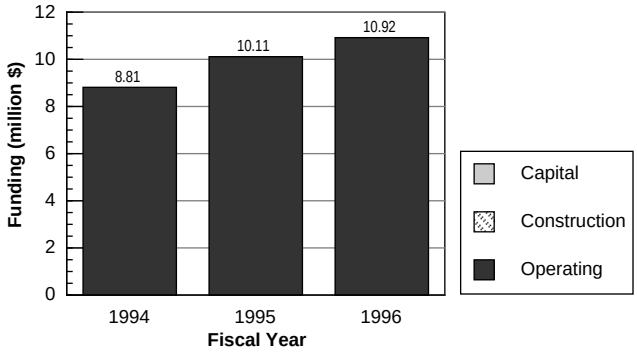
Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

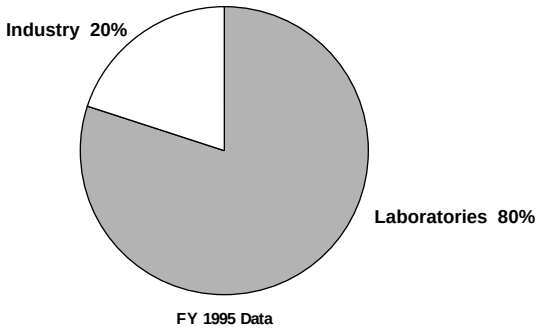
The United States requires the capability to deal with nuclear accidents and nuclear incidents worldwide. The Department of Energy, due to its expertise in managing the nuclear weapons stockpile, possesses the knowledge and national technical capabilities necessary to deal with such contingencies. The Department of Energy's seven major radiological Emergency Response assets and capabilities are consolidated under the Deputy Assistant Secretary for Military Application and Stockpile Support, which provides overall program management and the organizational structure during both emergency and nonemergency conditions for the personnel, equipment, and activities that collectively compose the program.

The Accident Response Group (ARG) is composed of a cadre of weapons designers and engineers, physical scientists, and other technical specialists from DOE's weapon complex, together with specially designed equipment that can collectively or independently be deployed by the Department to provide timely assistance to peacetime accidents and significant incidents involving nuclear weapons throughout the world. ARG-deployable capabilities include weapon diagnostics (radiography); robotics; liquid abrasive cutters; anticontamination clothing and respirators; personnel decontamination stations (showers/hotline operations); ground/soil contamination survey monitors and equipment; air, soil, and water analysis equipment; weapon packaging and containment equipment; and ground transportation for damaged weapons. ARG assumes onsite management of security at the scene of nuclear weapons incidents if the materials are in DOE custody when an incident occurs. ARG also provides technical advice for determining the radioactive hazards; assists in the collection, identification, and disposition of contaminated materials; and advises on the type of additional DOE resources that may be required. Onsite ARG direction is provided by a designated DOE senior official who, in coordination with the Program Office, is appointed by the DOE Albuquerque Operations Office. Equipment and personnel are based in several locations including Albuquerque, New Mexico; Las Vegas, Nevada; Amarillo, Texas; Livermore, California; and Los Alamos, New Mexico.

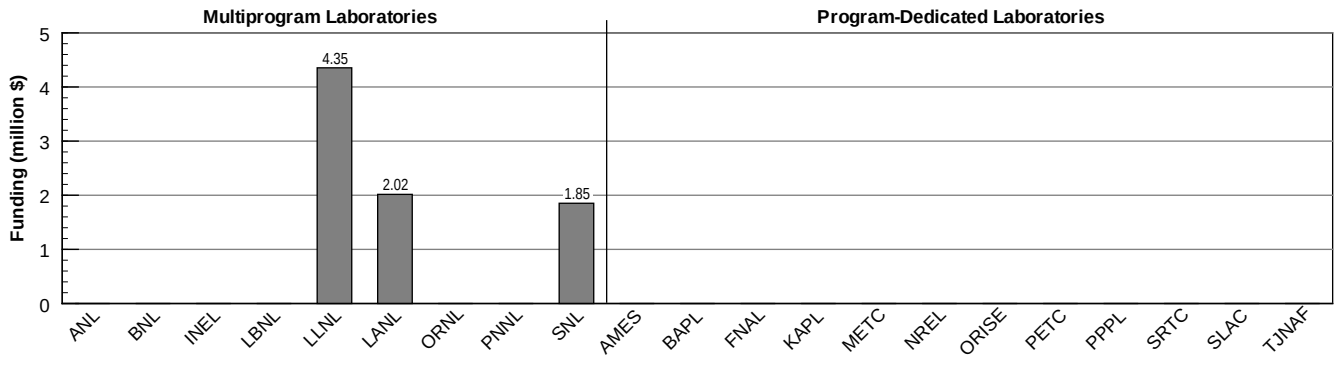
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Atmospheric Release Advisory Capability

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Support
Element: Emergency Response
B&R Code: GB010308

Laboratory Complex

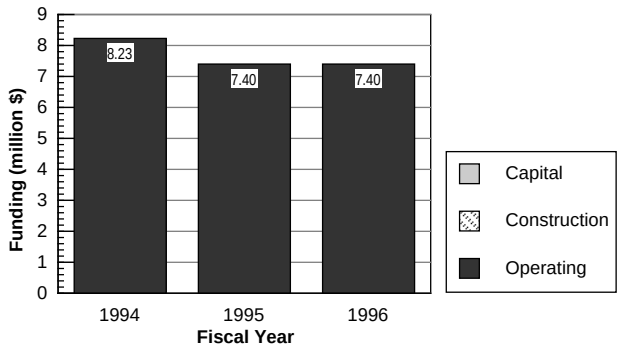
Principal Laboratories: LLNL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

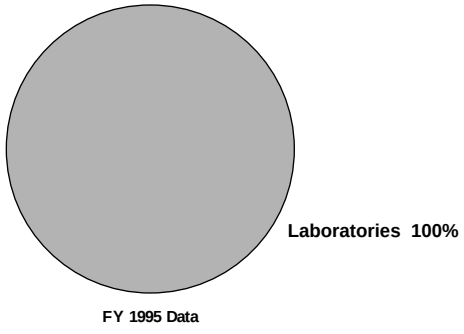
The United States requires the capability to deal with nuclear accidents and nuclear incidents worldwide. The Department of Energy, due to its expertise in managing the nuclear weapons stockpile, possesses the knowledge and national technical capabilities necessary to deal with such contingencies. The Department of Energy's major radiological Emergency Response assets and capabilities are consolidated under the Deputy Assistant Secretary for Military Application and Stockpile Support, which provides overall program management and the organizational structure during both emergency and nonemergency conditions for the personnel, equipment, and activities that collectively compose the program.

The Atmospheric Release Advisory Capability (ARAC) is a computer-based, emergency preparedness and response predictive capability that was developed for the Department of Energy by LLNL. ARAC provides rapid predictions of the transport, diffusion, and deposition of radionuclides released to the atmosphere and dose projections to people and the environment. ARAC's predictive capability supports both planning and real-time events at DOE and Department of Defense (DOD) sites, and is prepared to respond to any radiological accident in which the Department has an interest. The ARAC Center is located at, and is operated by, LLNL, Livermore, California. There are additional site system terminals at selected DOE and DOD locations throughout the United States. The ARAC-generated dispersion charts/isopleths are valuable tools for planning and implementing protective actions in the event of a major radiological incident.

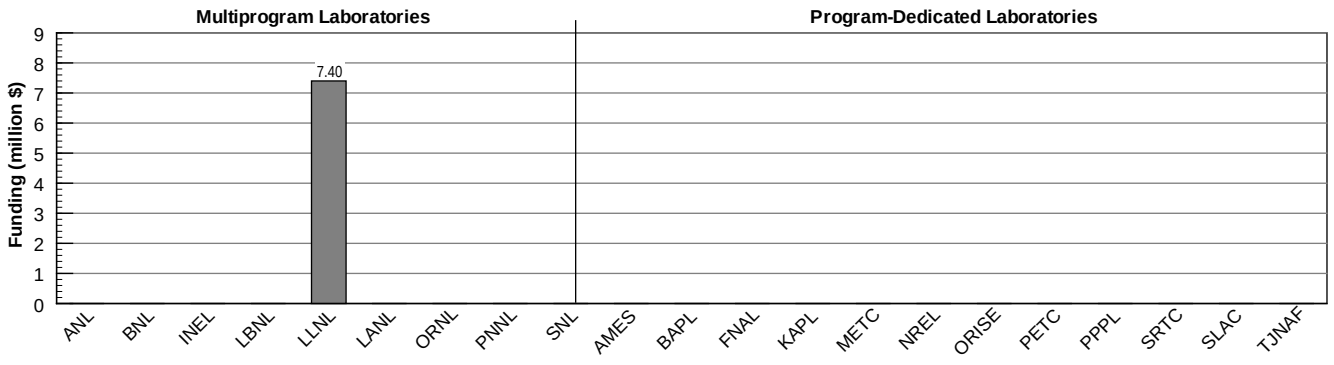
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Nuclear Weapons Complex Reconfiguration

Department of Energy Program

Program: Defense Programs
Office: Weapons Stockpile Management
Element: Nuclear Facilities
B&R Code: GB0602

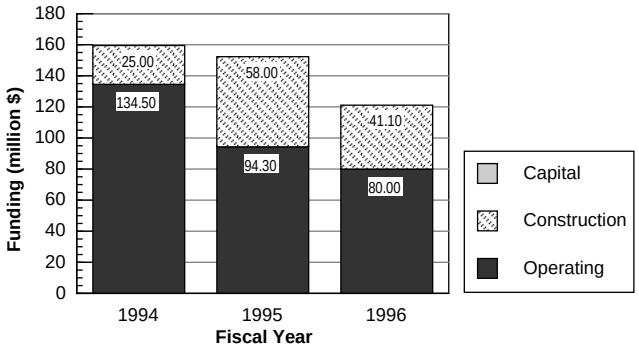
Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: LANL
Participating Laboratories: LLNL

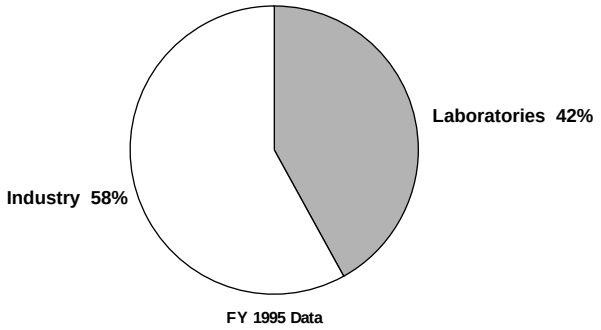
Mission Activity Description

In the past, the United States made a significant investment in facilities, equipment, and personnel to support its nuclear deterrent. Since the end of the Cold War, the United States has been reevaluating its defense structure to determine its proper size. A significant portion of the present nuclear weapons stockpile is no longer needed by the Department of Defense, and the large production rates of the past are no longer required. The Department of Energy, with responsibility for the Nation's nuclear stockpile, is downsizing its weapons complex in response to the reduced requirements. The Nuclear/Nonnuclear Facilities program supports the transfer and consolidation of the parts of the weapons complex to produce the smaller, more efficient complex needed for the future. The program covers the costs of making the transition as well as the qualification of the receiver sites in the transferred capabilities. Costs are covered in the nonnuclear area for capital improvements and activity transfers between sites, which include: technology and processes; transfer of inventories, conducting special studies, training, and certifying the workforces; conducting environmental safety studies; testing, evaluating, and transporting materials and components from one facility to another. For nuclear facilities, the program includes conceptual design and preoperational prove-in phases. Specific examples include the following: defining and developing manufacturing processes, transferring manufacturing processes and associated equipment, cleaning up existing facilities, transferring inventories and processing technologies to the selected site, conducting special studies, operating and maintaining the facilities through turnkey activities, hiring, transferring, training and certifying the workforce, project management, conducting environmental and safety studies, testing and evaluating, and transporting materials, parts, and components, from one facility to another. A programmatic environmental impact statement process is examining options for the Department to provide a more flexible and efficient production complex that can quickly respond to future needs.

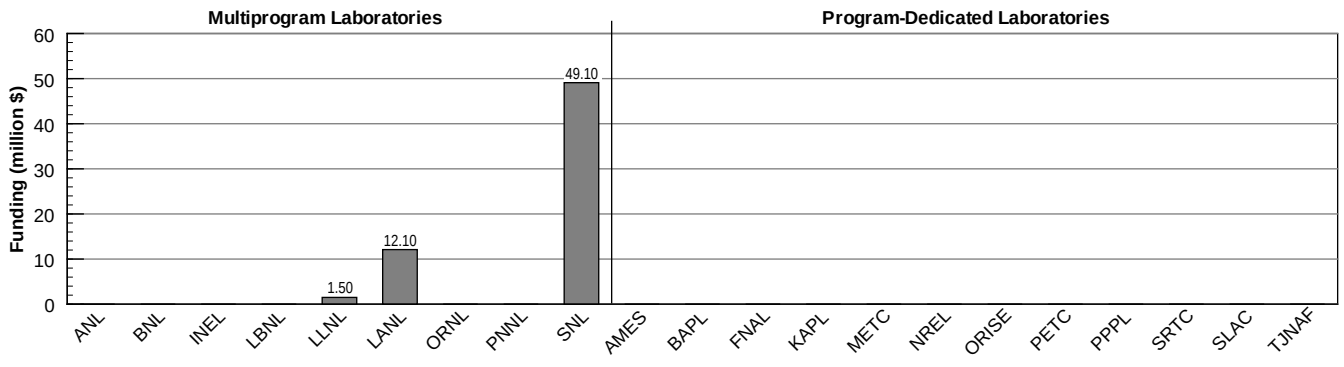
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Accelerator Production of Tritium

Department of Energy Program

Program: Defense Programs
Office: Tritium Project Office
Element: Accelerator Production of Tritium
B&R Code: Not available for FY95

Laboratory Complex

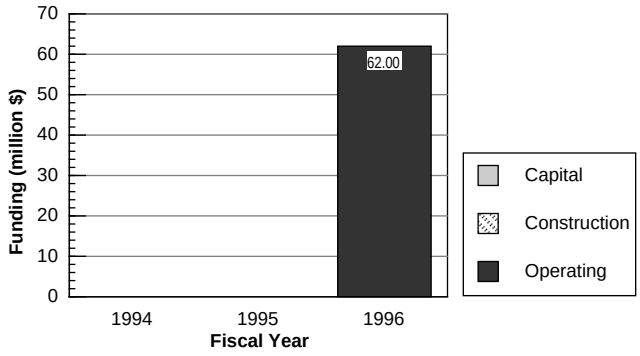
Principal Laboratories: LANL
Contributing Laboratories: None
Participating Laboratories: BNL, LLNL, SNL

Mission Activity Description

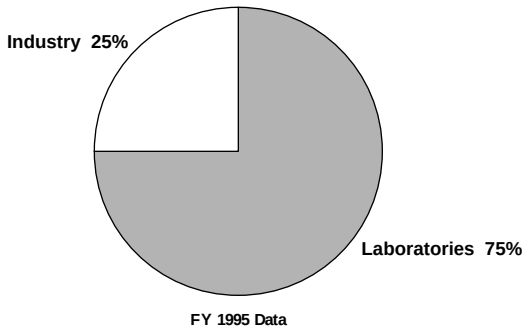
Modern nuclear weapons use tritium, a radioactive isotope of hydrogen, to enhance their yield. To maintain the nuclear weapons stockpile, as directed by the President in the Nuclear Weapon Stockpile Memorandum, the United States requires a reliable source of tritium. Because tritium has a relatively short radioactive half life of 12.3 years, it must be replenished periodically. No tritium has been produced in the United States since 1988. DOE is currently recycling tritium from retired weapons to meet the stockpile requirements. However, recycling can only meet tritium demands for a limited time; current projections indicate a START-II-sized U.S. nuclear weapons stockpile will require a new tritium source in approximately 2011. Larger stockpiles, consistent with START I and the 1996-2001 Nuclear Weapon Stockpile Memorandum, which has been signed by the President, will require new tritium production in approximately 2005.

Accelerator Production of Tritium (APT) is one of two production options capable of producing the necessary quantity of tritium. Because APT is a nonreactor technology, it is believed this technology option will encounter fewer siting, construction, and operational challenges than would a new reactor facility. Los Alamos National Laboratory is leading a multiple laboratory and site effort to demonstrate that the application of accelerator and spallation target technology can provide a reliable source of tritium that can be operated within acceptable scheduling and budgetary constraints. The APT accelerator would be much more powerful (130 megawatts) than the largest such linear accelerator in the complex (LANSCE at Los Alamos), so an engineering development and demonstration program has been recommended by Los Alamos and the other DOE laboratories supporting the effort, namely Brookhaven, Livermore, and Sandia. The accelerator option, if chosen, would be constructed at DOE's Savannah River Site, located near Aiken, SC.

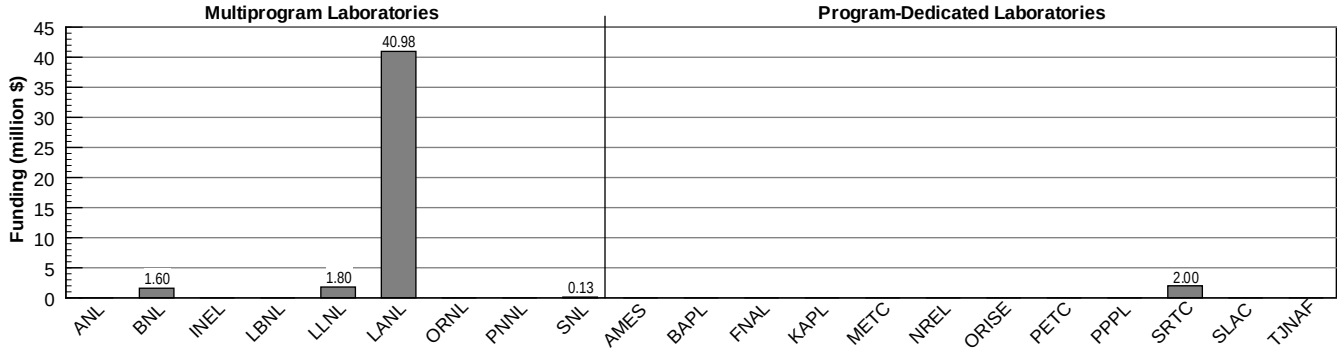
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1996 Funding Profile



Note: Funding profile for fiscal year 1996 is shown. SRTC received $2 million from the management and operating contractor at the Savannah River Site.

Alternative Tritium Production Technologies

Department of Energy Program

Program: Defense Programs
Office: Tritium Project Office
Element: Accelerator Production of Tritium
B&R Code: Not available for FY95

Laboratory Complex

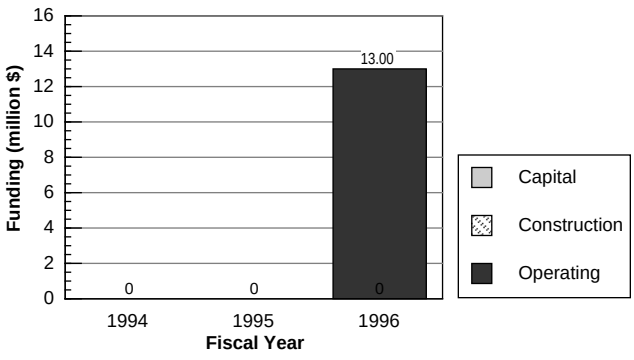
Principal Laboratories: INEL, PNNL
Contributing Laboratories: None
Participating Laboratories: BNL, SNL

Mission Activity Description

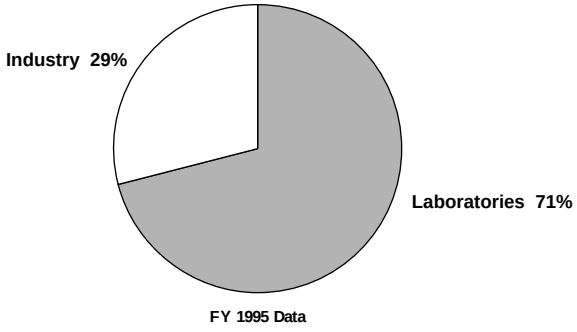
Modern nuclear weapons use tritium, a radioactive isotope of hydrogen, to enhance their yield. To maintain the nuclear weapons stockpile, as directed by the President in the Nuclear Weapon Stockpile Memorandum, the United States requires a reliable source of tritium. Because tritium has a relatively short radioactive half life of 12.3 years, it must be replenished periodically. No tritium has been produced in the United States since 1988. DOE is currently recycling tritium from retired weapons to meet the stockpile requirements. However, recycling can only meet tritium demands for a limited time; current projections indicate a START-II-sized U.S. nuclear weapons stockpile will require a new tritium source in approximately 2011. Larger stockpiles, consistent with START I and the 1996-2001 Nuclear Weapon Stockpile Memorandum, which has been signed by the President, will require new tritium production in approximately 2005.

As part of a dual-track approach to meeting future tritium needs, DOE is examining accelerator production of tritium and tritium production in commercial light-water nuclear reactors. Using nuclear reactors to irradiate targets from which tritium can be extracted was the technique successfully utilized prior to the halt of tritium production in 1988. The major thrusts of the program at present are target qualification and reactor acquisition. The program to qualify new targets from which tritium can be extracted is composed of several phases: target design, development, and testing; target qualification; target fabrication and extraction; and production engineering. Each phase will be conducted at one or more labs or plants, depending on the capabilities possessed by each.

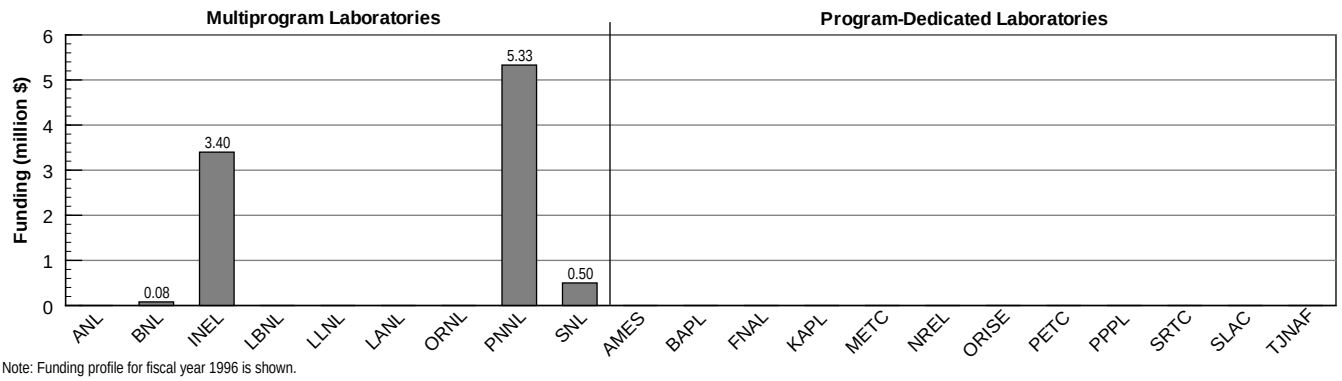
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1996 Funding Profile



Note: Funding profile for fiscal year 1996 is shown.

Nuclear Materials Surveillance

Department of Energy Program

Program: Defense Programs
Office: Military Application and Stockpile Maintenance
Element: Stockpile Management
B&R Code: GE

Laboratory Complex

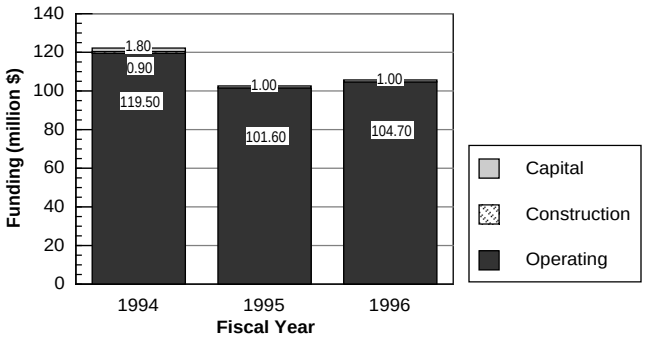
Principal Laboratories: LANL, ORNL
Contributing Laboratories: BNL
Participating Laboratories: ANL, LLNL, ORISE, SNL

Mission Activity Description

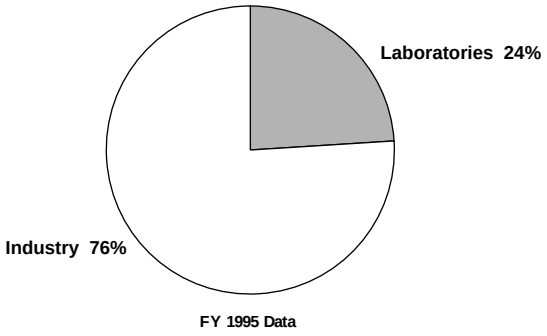
The Department of Energy is responsible for ensuring the safety and security of the Nation's special nuclear materials and its nuclear weapons. As the weapons complex is downsized, facilities and material may be deemed excess to the needs of the enduring stockpile. The Nuclear Materials Surveillance activity funds the storage, handling, shipping, safeguarding, control and accountability, and disposition for Defense Programs nuclear materials located at Defense Programs' facilities and former Defense Programs' facilities that have been transferred to Environmental Management at the Fernald, Hanford, Idaho, and Savannah River sites. This program supports the Defense Programs safety, safeguards, and security oversight activities that include policy guidance, review and evaluation of existing programs, compliance with regulations, and the review of ongoing program cost-effectiveness.

Programmatic activities include the following: safety analysis and evaluation reports; design report rules, guidance and standards; risk-based prioritization methods; mentoring support; accident consequence methods; operational readiness reviews; training support and assistance; technical support for maintenance and safeguards and security of Defense Programs facilities; operation of Building 9206 at Y-12 Plant until phaseout and transfer to Building 9212; decontamination and refinement of surplus precious metals; operation of U-233 Storage and Distribution Center; coordination with U.S. Enrichment Corporation for sale of excess low enriched uranium; safeguards and security protection for Defense Programs-owned special nuclear materials (SNM) at Hanford, Fernald, Idaho, and Savannah River; and the Special Projects Program.

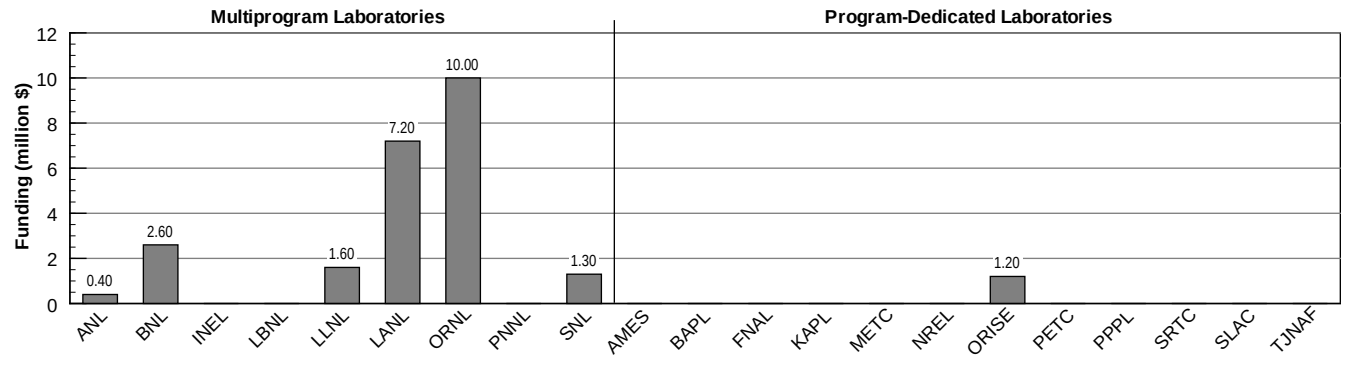
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Onsite Systems

Department of Energy Program

Program: Nonproliferation and National Security
Office: Research and Development
Element: Onsite Systems
B&R Code: GC0401

Laboratory Complex

Principal Laboratory: LLNL, SNL
Contributing Laboratories: LANL, ORNL, PNNL
Participating Laboratories: ANL, BNL, INEL

Mission Activity Description

The Onsite Systems Program's activities focus on the development and demonstration of prototypes of detection technology and analytical methods to support on a timely basis both current and future U.S. Government policies and initiatives on arms control and nonproliferation. The program focuses on cooperative transparency and confidence-building measures that use both portable and unattended instrumentation with real-time analysis and data display capabilities. The priorities of the program are driven by longstanding and current policies from the intelligence and arms control communities.

Radiation Detection Technologies—This core research technology development activity advances the state of the art in radiation sensor materials.

Warhead Dismantlement and Transparency—Advanced technical means are developed to verify accountability and chain of custody of nuclear weapons.

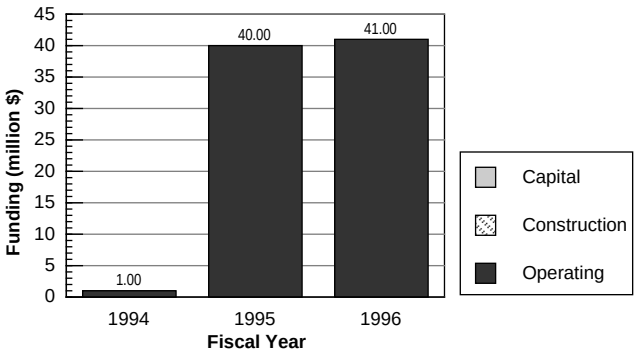
Special Nuclear Material Accountability—Advanced technical means are developed to verify accountability and chain of custody of special nuclear material.

Underground Structure Detection—Onsite geophysical measurements research provides a key technical base to support interagency requirements to detect and characterize subsurface targets related to the acquisition, production, and maintenance of weapons of mass destruction.

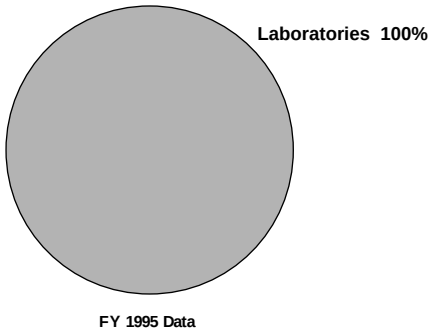
Cooperative Monitoring—Cooperative monitoring results in the development of unattended or hand-held detection technologies and systems to support U.S. Government initiatives, treaties and agreements for control of weapons of mass destruction.

Airborne Multisensor Pod System—The Airborne Multisensor Pod System (AMPS) program provides a multisensor data collection platform that will be used to test and evaluate data fusion concepts.

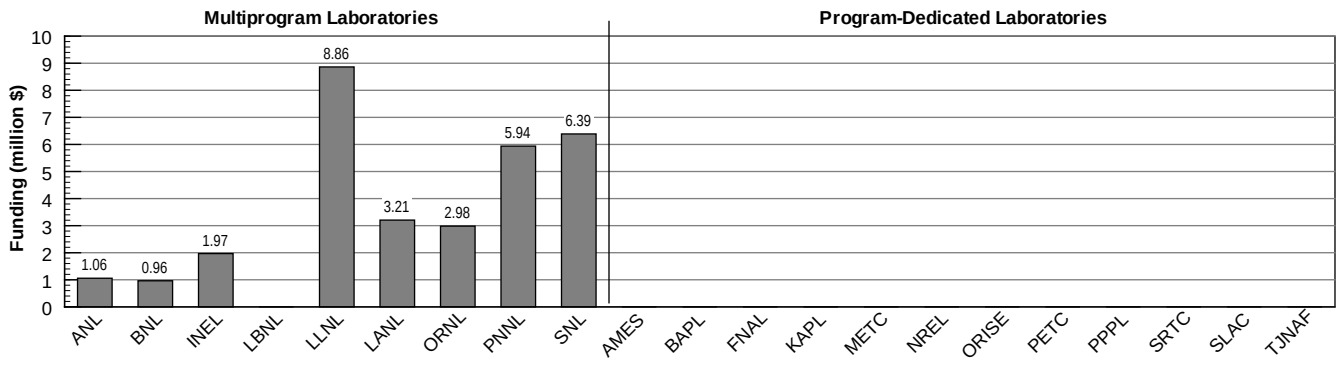
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Regional Monitoring Systems

Department of Energy Program

Program: Nonproliferation and National Security
Office: Research and Development
Element: Regional Monitoring Systems
B&R Code: GC0402

Laboratory Complex

Principal Laboratories: LANL, LLNL
Contributing Laboratories: PNNL, SNL
Participating Laboratories: ANL, INEL, ORNL

Mission Activity Description

Regional monitoring activities focus on technology development in support of the detection, location, and characterization of nuclear proliferation activities. The technology research has two thrusts: (1) identification of suspect activity through the use of effluents to fingerprint nuclear weapon production activities, and (2) comprehensive test ban verification, where subsurface data can be integrated with other technology data to detect and identify testing activities.

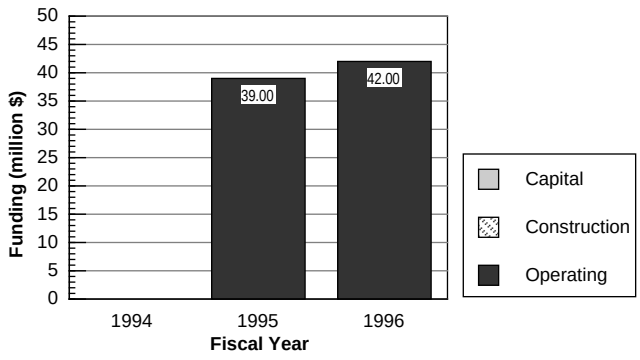
Effluent Detection and Analysis

Effluent detection and analysis technology is being developed to find and analyze chemical signatures indicative of nuclear weapons proliferation and production. Efforts to identify effluent analysis methods and technology potentially applicable to the monitoring of a comprehensive nuclear weapons test ban are being given the highest priority. This effort includes the development of real-time in-situ methods and instrumentation for regional environmental radionuclide monitoring networks and advanced ultrasensitive laboratory instrumentation for chemical isotopic analysis.

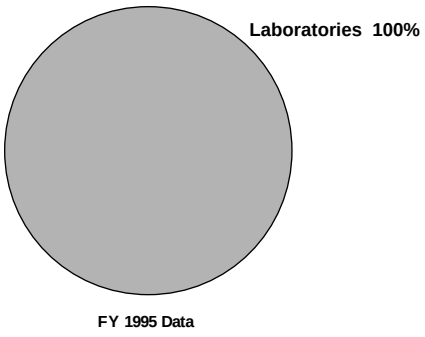
Comprehensive Test Ban Treaty Research and Development

The subsurface monitoring research and development program has been redirected to absorb the seismic research and development activities formerly performed by the Advanced Research Projects Agency. The objective is to provide U.S. Government agencies responsible for monitoring or verifying compliance with a future Comprehensive Test Ban Treaty with technologies, algorithms, hardware, and software for integrated systems to detect, locate, and characterize subsurface nuclear explosions at the thresholds and confidence levels that meet U.S. requirements in a cost-effective manner. Research is focused on methods and systems development to effect discrimination between nuclear detonations, earthquakes, and large chemical explosions at relatively low levels. The subsurface monitoring program is organized according to five areas: seismic monitoring, ocean monitoring, infrasound, onsite inspection, and automated data processing.

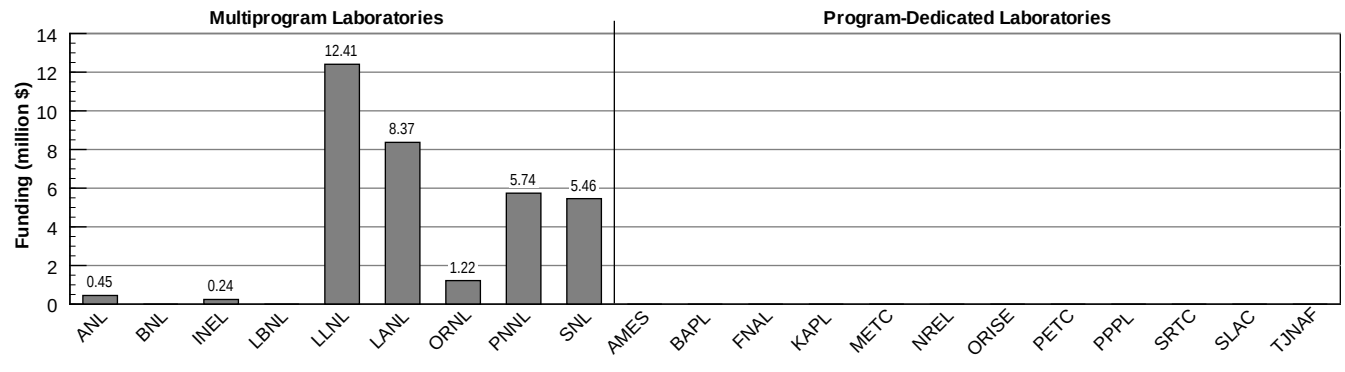
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Remote Sensing Systems

Department of Energy Program

Program: Nonproliferation and National Security
Office: Research and Development
Element: Remote Sensing Systems
B&R Code: GC0403

Laboratory Complex

Principal Laboratories: LANL, SNL
Contributing Laboratories: None
Participating Laboratories: INEL, LLNL

Mission Activity Description

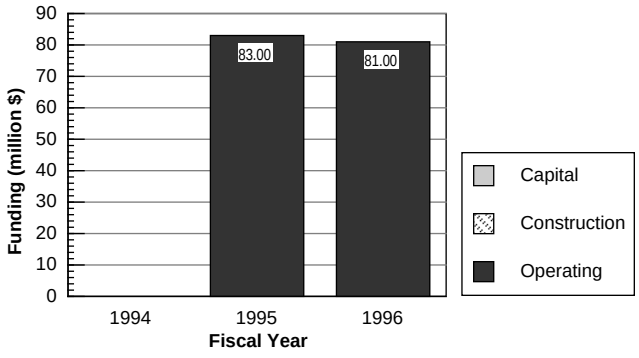
Remote sensing activities result in the development of special sensors for deployment on satellite platforms for nuclear explosion detection and proliferation detection. The base technology and infrastructure program develops new satellite technologies and evaluates new sensor concepts. It also provides capabilities for automated design definition, fabrication oversight, environmental testing, component traceability, and as needed, failure analysis and flight-quality repair of DOE instrumentation systems for satellite applications.

Nuclear explosion detection technology results in the implementation of operational payloads meeting national monitoring requirements for detecting nuclear explosions in the atmosphere and in near-Earth space. This program has three primary objectives: verification of the Limited Test Ban Treaty (and eventually a comprehensive test ban treaty), monitoring related to nuclear testing and the Nuclear Nonproliferation Treaty, and strategic battle management in the event of nuclear war (funding for this third objective is provided by the Air Force).

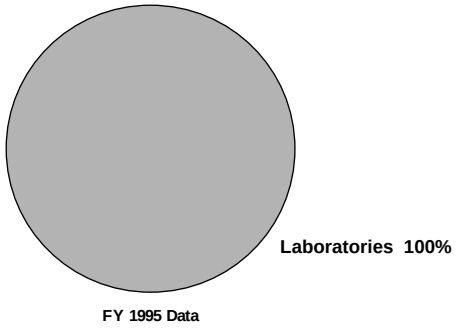
Sensors and systems deployed for these purposes will be of fundamental importance to the monitoring of a worldwide comprehensive nuclear test ban. Operational systems currently profile continuous worldwide surveillance from the Global Positioning System and other military platforms. Ninety-nine satellite and space probe payloads have been launched during the 35 years of this program.

The proliferation detection technology program represents a broadening in scope in support of U.S. Government concerns and initiatives regarding the proliferation of weapons of mass destruction. This is an advanced technology development effort dedicated to proof-of-concepts and demonstrations of new technology and capabilities applicable to nuclear proliferation activities prior to device detonations, as well as to the remote detection of other clandestine activities having military significance. This program also provides a test-bed for intelligence- and environment-related multiple-use remote sensor systems.

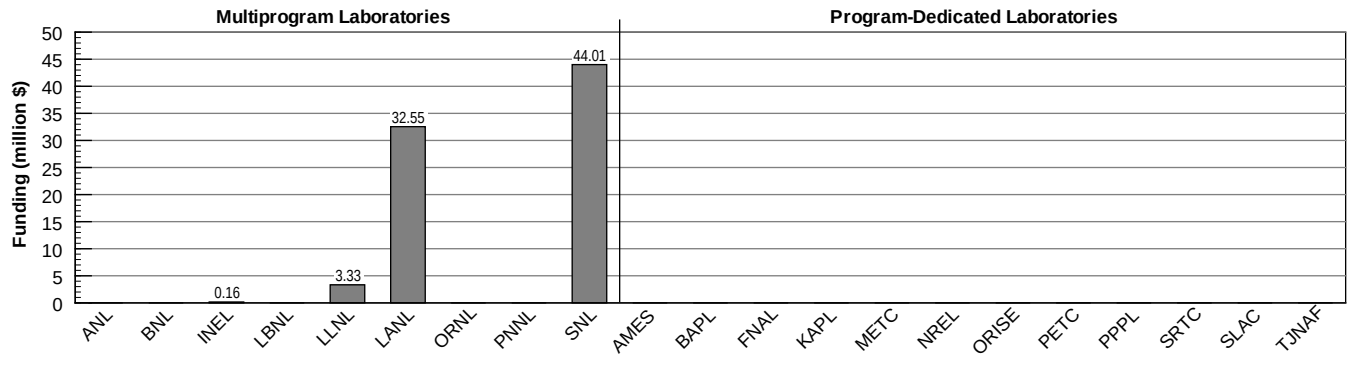
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Advanced Systems

Department of Energy Program

Program: Nonproliferation and National Security
Office: Research and Development
Element: Advanced Systems
B&R Code: GC0404

Laboratory Complex

Principal Laboratories: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: ANL, BNL, INEL, ORNL, PNNL

Mission Activity Description

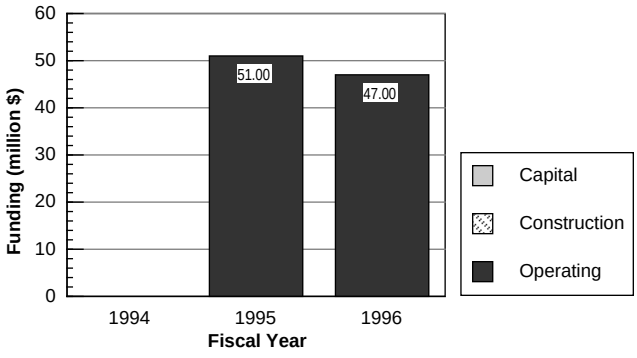
Verification and Control Technology Advanced Systems programs are structured to encourage new and innovative thinking on technological solutions to U.S. treaty verification and proliferation detection capabilities. In addition to numerous individual small exploratory efforts, two major programs are supported in the areas of laser-based remote measurement methods and multisensor systems research.

A laser-based chemical analysis and identification program is under way. It aims to provide unparalleled standoff proliferation detection capabilities through the use of novel techniques and to result in significant advances in sensitivity and selectivity in remotely detecting and monitoring chemical effluents. This activity is being coordinated across the U.S. Government by the Nonproliferation and Arms Control Technology Working Group, in order to minimize any overlap with similar laser-based sensing activities under way outside the Department of Energy. This initiative is referred to as the Chemical Analysis by Laser Interrogation of Proliferation Effluents project. The effort has begun with optical signature analyses, leading to laboratory and field testing, then progressing where feasible to field proof-of-concept demonstrations.

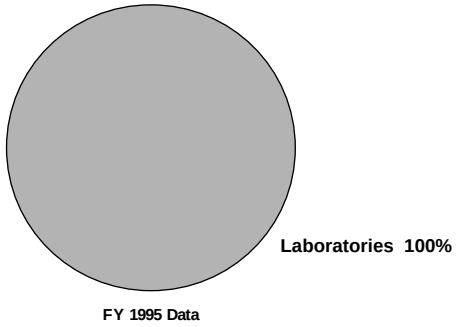
The multisensor systems research program develops advanced computer methods for converting massive amounts of data to usable information in a timely manner. The program explores methods and levels of data fusion to exploit the potential synergism in multisensor data collection. An example of a project in this program is deployable adaptive event recognition and processing systems. The purpose of this project is to develop and test prototype neural network hardware to accomplish adaptive event recognition and processing for a variety of applications, including small satellite, airborne, and ground-based nonproliferation efforts.

Exploratory research advanced concepts projects are supported at each of the national laboratories covering the full scope of treaty verification and nonproliferation problems. These activities are often high-risk, proof-of-concept efforts which, if proven, promise to provide the basis for new projects.

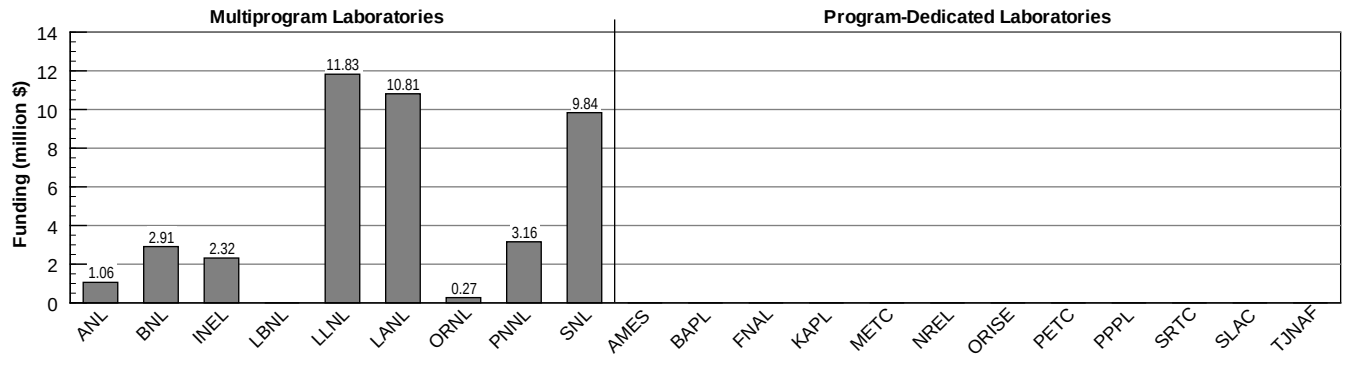
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Arms Control and Nonproliferation

Department of Energy Program

Program: Nonproliferation and National Security
Office: Arms Control and Nonproliferation
Element: Arms Control and Nonproliferation
B&R Code: GJ07, GJ06, GJ04, GJ01, GJ02

Laboratory Complex

Principal Laboratory: LANL, LLNL, SNL
Contributing Laboratories: None
Participating Laboratories: ANL, BNL, INEL, ORISE, ORNL, PNNL

Mission Activity Description

This activity consists of the following five major functional areas:

Secure Nuclear Materials and Expertise in the Former Soviet Union—The essential limiting factor in the ability to manufacture a nuclear weapon is fissile material. Activities included in this category are cooperation with former Soviet Union nations on protection, control, and accounting of weapons-usable nuclear material. Activities to prevent nuclear smuggling, prevent "brain drain," and increase industrial partnering programs are also consolidated here.

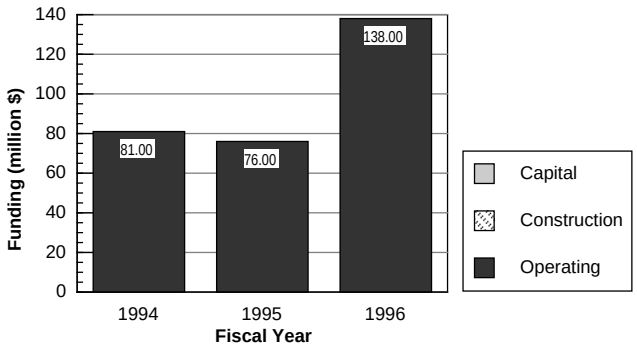
Limit Weapons-Usable Fissile Materials—The cessation of the use of weapons-grade plutonium from production reactors, elimination of the civil use of highly enriched uranium (HEU) and promotion of alternatives to the civil use of plutonium, reduction of stockpiles of HEU and plutonium, and efforts to initiate regional fissile material control activities and disposition of weapons-usable materials are included under this broad category.

Establish Transparent and Irreversible Nuclear Reductions—Transparency refers to the need for nations to confirm dismantlement and nonreuse of warheads and materials. Irreversibility means ensuring that materials declared excess to security needs are not reused in nuclear weapons. Activities incorporated in this category include efforts to expand negotiated weapons reductions and to implement the purchase of 500 tonnes of HEU from dismantled Russian warheads.

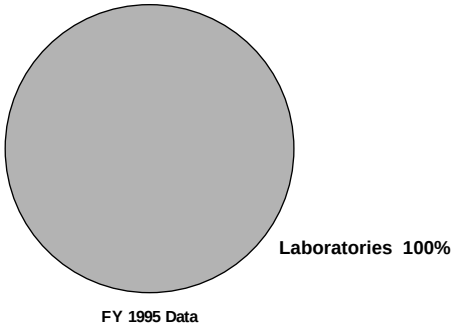
Strengthen the Nuclear Nonproliferation Regime—This category combines those activities that relate to treaties and agreements, such as compliance with the Non-Proliferation Treaty, negotiations for the Comprehensive Nuclear Test Ban Treaty, support for IAEA inspections and effectiveness, and promotion of regional safeguards and nonproliferation measures.

Control Nuclear Exports—Programs to control nuclear exports, including assistance to states of the former Soviet Union, reform of statutory licensing requirements, strengthening of multilateral supplier initiatives, and the promotion of expanded information sharing and analysis are considered here as a single category.

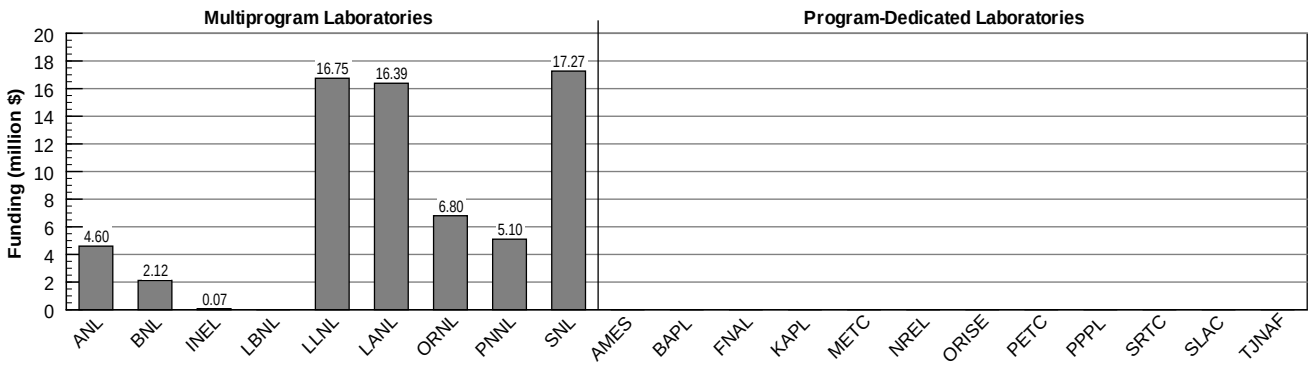
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Analytical Support

Department of Energy Program

Program: Nonproliferation and National Security
Office: Energy Intelligence
Element: Nuclear Nonproliferation
B&R Code: NT0101, NT0102, NT0103, NT0104

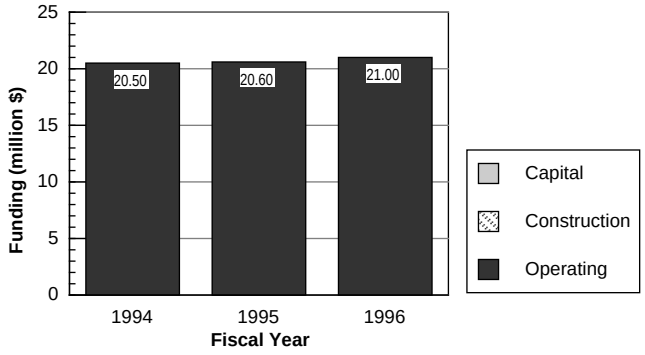
Laboratory Complex

Principal Laboratory: LANL, LLNL, PNNL
Contributing Laboratories: SNL
Participating Laboratories: ANL, INEL, ORNL, SRTC

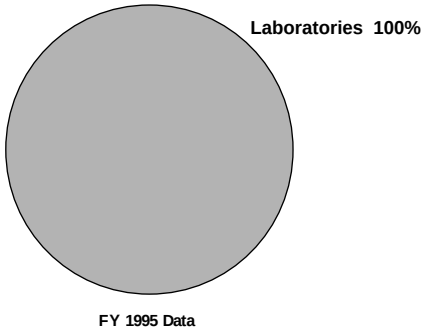
Mission Activity Description

Analytical support is provided for intelligence assessments of foreign government policies and market developments that could affect long-term supply and demand for energy resources worldwide, including price and availability, estimated changes in demand in the mix of energy uses, and assessments of the stability of world and regional economies. Monitoring and analyses of safety and environmental issues pertaining to foreign nuclear energy programs are provided, including ranking the safety of foreign nuclear reactors, assessing potential and existing radioactive contamination, particularly in the republics of the former Soviet Union. Support is provided in the ongoing analysis of potential, existing, and advanced nuclear weapons activities worldwide and the threat to the United States from these activities. Analyses of nuclear capability in proliferant countries is provided, consistent with the Secretary of Energy's goal of addressing increased global nuclear proliferation challenges.

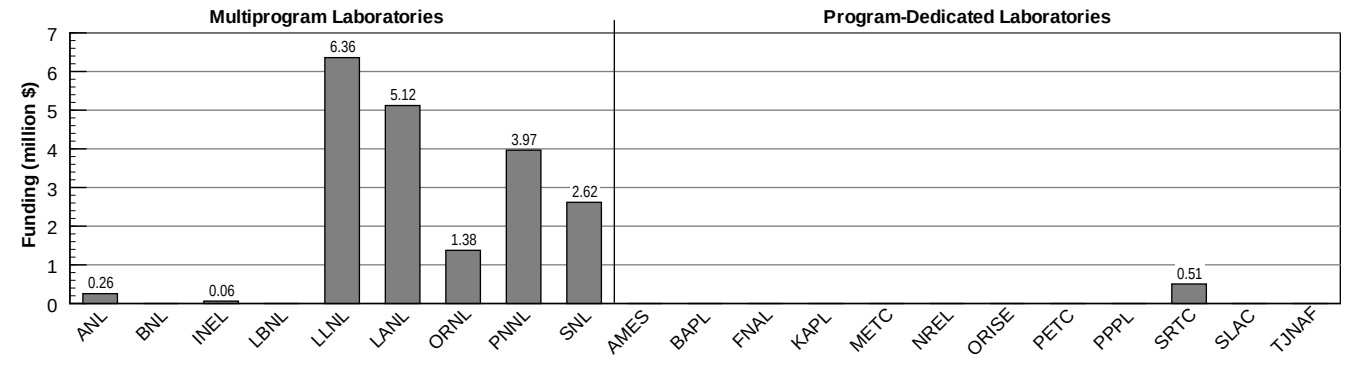
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Threat Assessment

Department of Energy Program

Program: Nonproliferation and National Security
Office: Energy Intelligance
Element: Energy Assessments
B&R Code: NT0201, NT0203

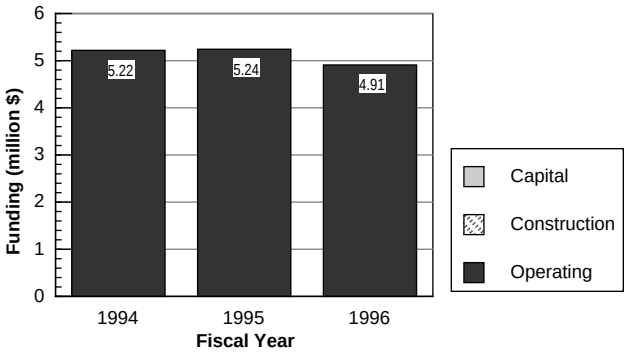
Laboratory Complex

Principal Laboratories: INEL, ORNL, SRTC
Contributing Laboratories: None
Participating Laboratories: ANL, PNNL, SNL

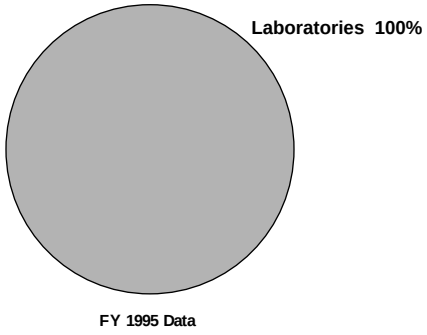
Mission Activity Description

Threat assessment support is provided with a focus on energy-management-related assessments in various areas of the country. Specialized studies are conducted in specific areas of the foreign threat spectrum. Foreign and domestic terrorism activities are monitored and analyzed. The threat assessment database is maintained. Support provides nuclear/energy threat awareness training directed at the intelligence and law enforcement communities; provides communicated threat credibility assessments by maintaining and enhancing the capability to provide technical, operational, and behavioral assessments of specific threats involving nuclear material or Department facilities; provides analyses of nuclear material black market incidents and trends; supports the conduct of technology assessments of worldwide state-or-the-art applied research and technical development activities related to counterterrorism, counternarcotics, intelligence, and other departmental national security responsibilities; and provides support to the Department's 24-hour on-call intelligence and technical response activity.

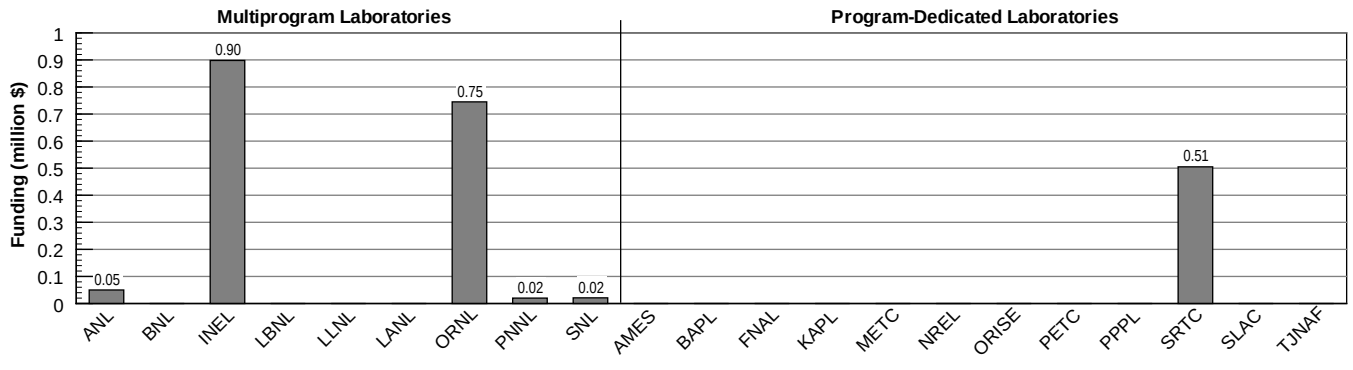
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Counter Intelligence

Department of Energy Program

Program: Nonproliferation and National Security
Office: Energy Intelligence
Element: Counter Intelligence
B&R Code: NT0301

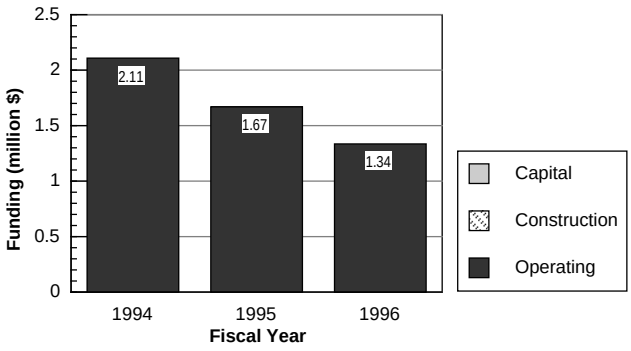
Laboratory Complex

Principal Laboratory: PNNL
Contributing Laboratories: None
Participating Laboratories: INEL

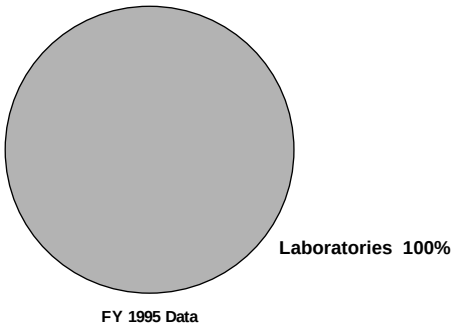
Mission Activity Description

Counter Intelligence support provides analysis in support of nuclear weapons nonproliferation, provides awareness training and threat briefings and debriefings, provides comprehensive foreign traveler briefings and debriefings for DOE travelers and hosts, and provides support as necessary to the Department's treaty implementation activities. This activity provides analysis for counter intelligence activities as described in Executive Order 12333.

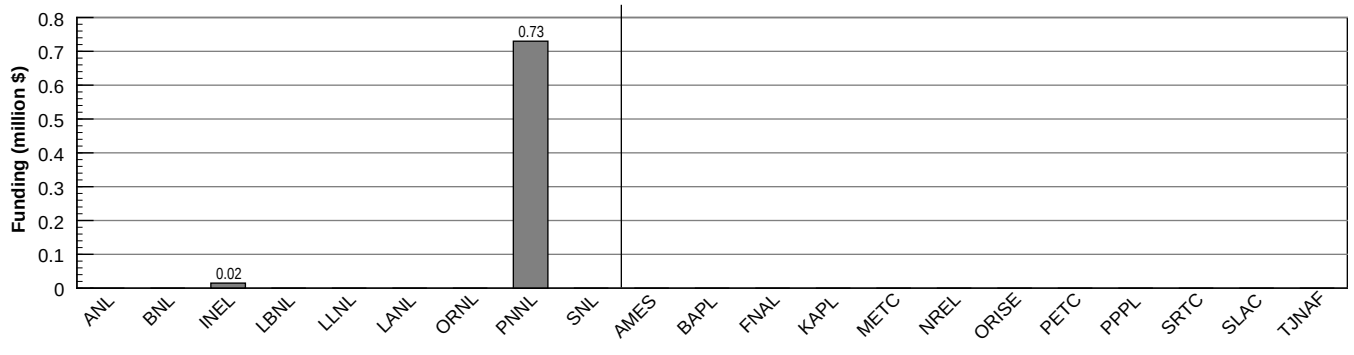
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Technical Support

Department of Energy Program

Program: Nonproliferation and National Security
Office: Energy Intelligence
Element: Intelligence Support
B&R Code: NT04

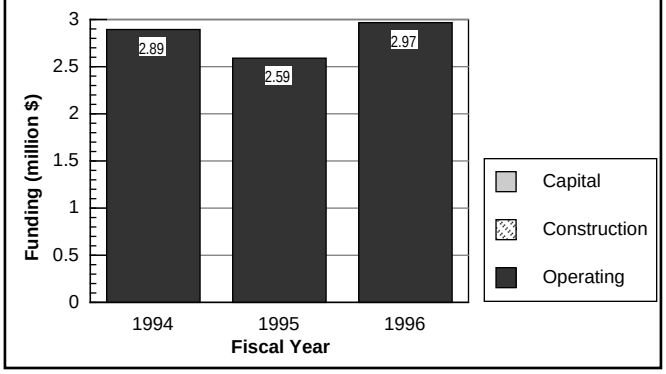
Laboratory Complex

Principal Laboratory: PNNL
Contributing Laboratories: LANL, LLNL
Participating Laboratories: SNL, SRTC

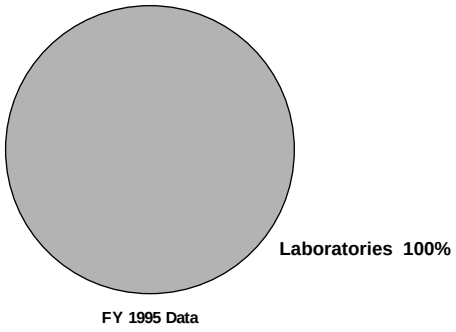
Mission Activity Description

This activity provides technical support for the maintenance of information networks and systems and, additionally, multispectral analysis of imagery data in support of laboratory intelligence activities.

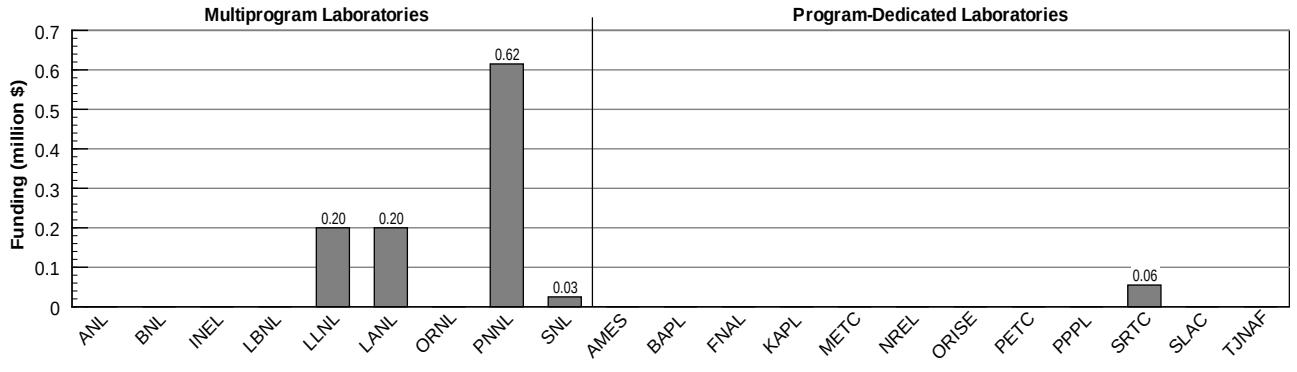
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Technology Development

Department of Energy Program

Program: Nonproliferation and National Security
Office: Nuclear Safeguards and Security
Element: Science and Technology Development
B&R Code: GD06

Laboratory Complex

Principal Laboratory: LANL, SNL
Contributing Laboratories: LLNL, ORNL
Participating Laboratories: ANL, BNL

Mission Activity Description

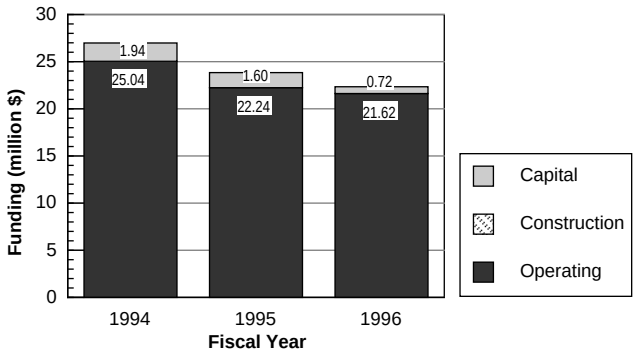
This activity is to develop state-of-the-art technologies related to safeguarding the Department of Energy's facilities, nuclear weapons, nuclear materials, and classified material. Specifically, the program addresses identified safeguards and security deficiencies and policy objectives with technological solutions. The program provides the technical base for other DOE programs as well as for other agencies and foreign countries. The systematic development of these technologies may require a technology to progress through three different stages science technology development, concept demonstration, and full-scale demonstration.

Material Control and Accounting—The material control and accounting program provides the required capabilities to accurately measure special nuclear materials, account for their quantity and location, provide measures to control and detect access to these materials, and to detect their theft or unauthorized diversion. Research efforts are focused in nuclear material measurements, nuclear material accounting, material control, and statistical methods.

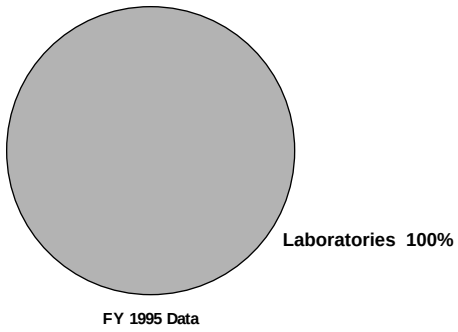
Physical Security—The physical security portion of the program develops physical protection technologies and systems for the purpose of preserving national security, protecting key assets, eliminating maintenance costs of old systems, and reducing recurring high costs for manpower. Research efforts are focused in the areas of detection, access control, access delay, alarm control and display, and personnel subsystems.

Information Security—The information security portion of the program is concerned with protecting classified and sensitive information from unauthorized users. Activities are focused on advice and assessment, education and awareness, incident response, tools and technology, and integration and assurance.

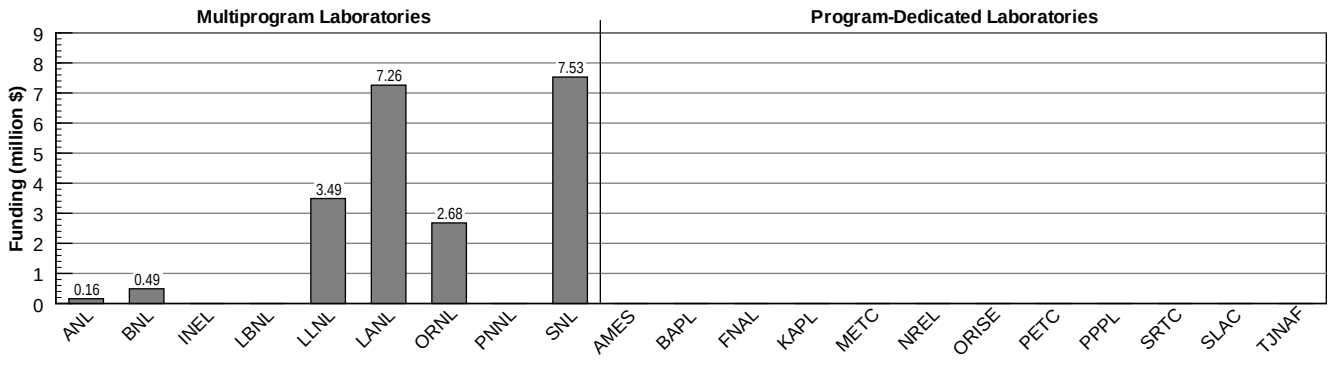
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Storage Options

Department of Energy Program

Program: Fissile Materials Disposition
Office: Office of the Technical Director
Element: Fissile Materials Storage Options
B&R Code: GA0101

Laboratory Complex

Principal Laboratory: LANL, LLNL
Supporting laboratories: None
Participating Laboratories: ORNL, PNNL, SNL

Mission Activity Description

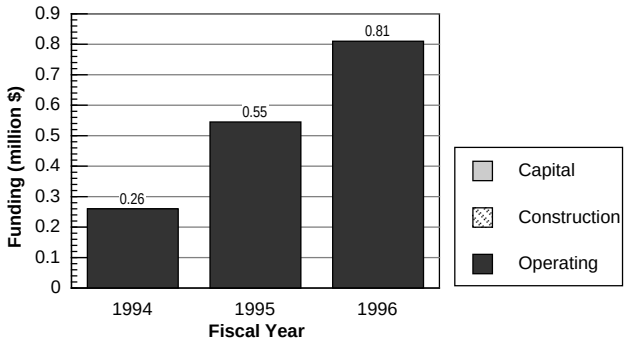
The Storage Options element of the Fissile Materials Disposition Program supports the National Security Mission by providing alternatives for the safe, secure, environmentally sound future storage of the Department's weapons-usable fissile materials (plutonium and highly enriched uranium) and encouraging reciprocal actions abroad. Currently the Department's plutonium inventory is located at numerous sites across the DOE complex which are not suitable for the long-term storage of plutonium.

The Program is preparing design, cost, schedule, nonproliferation, and environmental analyses of storage alternatives (options) in order to prepare a Programmatic Environmental Impact Statement (PEIS) and a Record of Decision. These storage alternatives include: (1) continued storage in existing facilities (no action), (2) upgrade of current facilities, and (3) consolidated storage in a new facility.

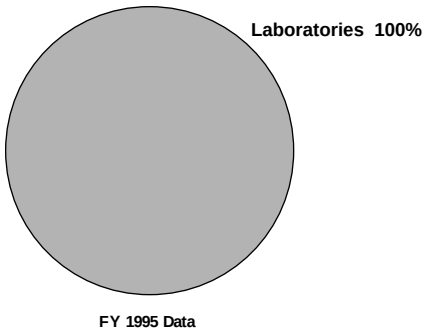
Laboratory technical and scientific support in this program element is focused on providing storage facility evaluation data to support the PEIS and Record of Decision based on their technical expertise and current responsibilities associated with the storage and management of these materials. This includes the evaluation of new facility designs and upgrades to existing facilities that are being evaluated in the PEIS as required by the National Environmental Policy Act (NEPA). Laboratory efforts also include addressing issues associated with the identification, preparation, and packaging of materials for storage, storage container design, and storage facility safety evaluations and compliance.

Additional National Security Mission-related efforts focus on the coordination of integral facility requirements such as material control and accountability, safeguards and security, surveillance, and transparency/inspectability. Plutonium storage expertise provided by LANL is also required to support the U.S./Russian Joint Study established to foster cooperation with Russian counterparts on the evaluation of plutonium storage and disposition options and to implement small scale technology demonstrations.

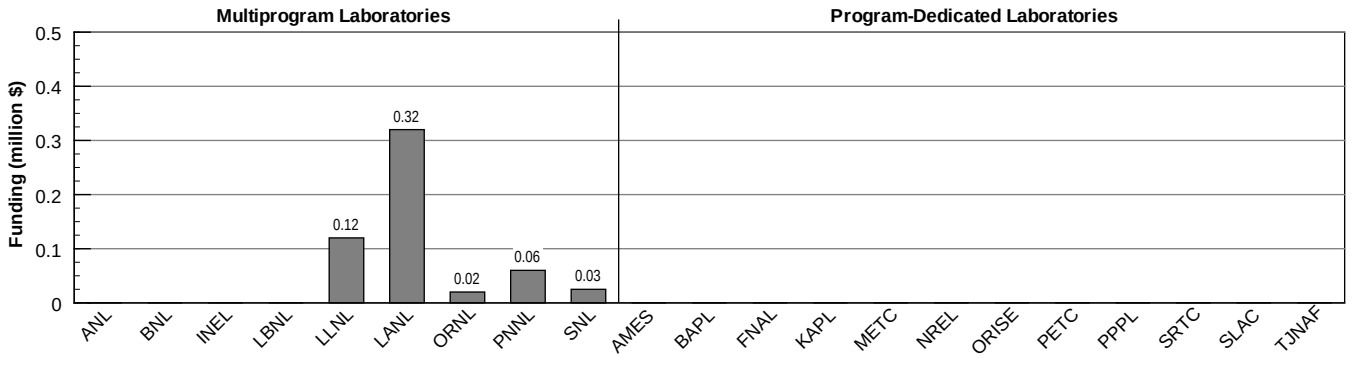
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Disposition Options

Department of Energy Program

Program: Fissile Materials Disposition
Office: Office of the Technical Director
Element: Fissile Materials Disposition Options
B&R Code: GA0102

Laboratory Complex

Principal Laboratory: LLNL, ORNL
Contributing Laboratories: LANL
Participating Laboratories: ANL, BNL, INEL, SNL, PNNL

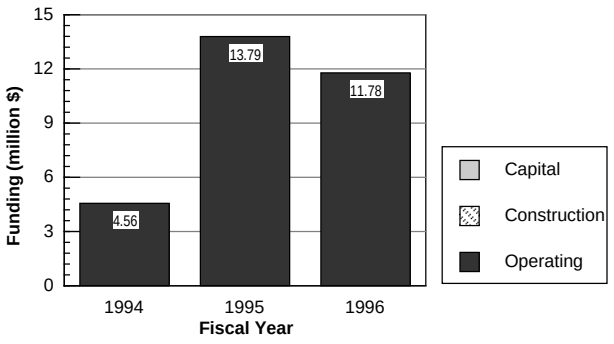
Mission Activity Description

The Disposition Options element of the Fissile Materials Disposition Program supports the National Security Mission by providing alternatives for the disposition of weapons-usable fissile materials declared surplus to national defense needs. The global stockpiles of plutonium and highly enriched uranium (HEU) pose a danger to national and international security in the form of potential proliferation of nuclear weapons if not properly managed and safeguarded. The disposition of these materials directly contributes to the advancement of U.S. and global nonproliferation interests. This activity provides design, cost, schedule, nonproliferation and environmental analyses of disposition options in order to support the preparation of Programmatic Environmental Impact Statements and Record(s) of Decision.

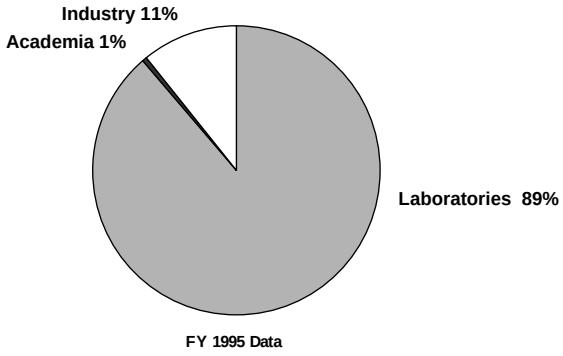
The proposed options for surplus plutonium disposition include conversion to mixed oxide fuel for use in nuclear power reactors, immobilization in glass or other materials, and direct geologic disposition in deep boreholes drilled into the earth. Options for surplus HEU disposition include continued storage as HEU, blending down for use as reactor fuel, and blending down for disposal as waste. The selected national laboratories are evaluating these disposition options based on their expertise in nuclear material management and material science in addition to their role in the development of nuclear waste cleanup technologies.

Options for dealing with fissile material disposition are complex and require substantial analysis and integration across national laboratories and Department facilities to address environmental impacts, technical viability, cost, schedule, and nonproliferation-related issues. This mission activity provides foundation for the selection of preferred options and assists the program in defining the path forward for the disposition of surplus fissile materials.

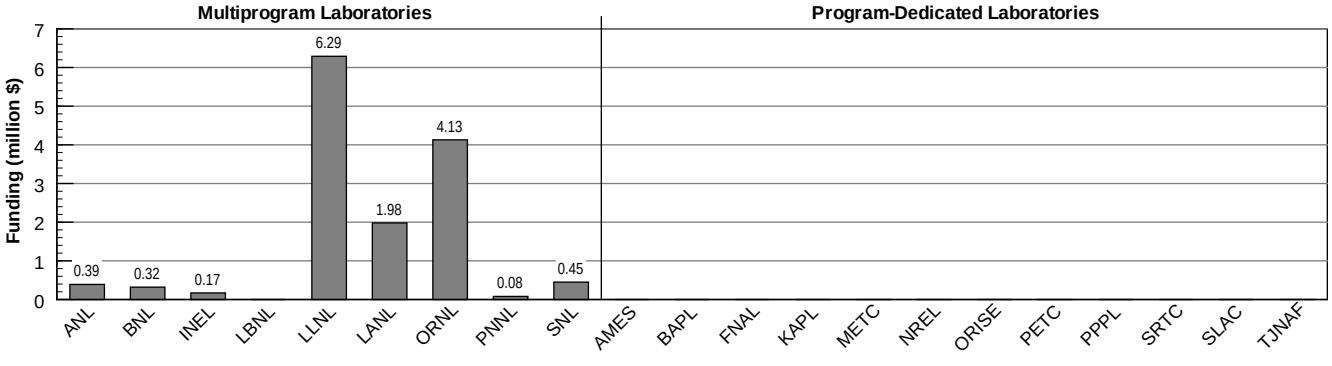
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Technical Integration

Department of Energy Program

Program: Fissile Materials Disposition
Office: Office of the Technical Director
Element: Technical Integration, Support, and Associated Technologies
B&R Code: GA0103

Laboratory Complex

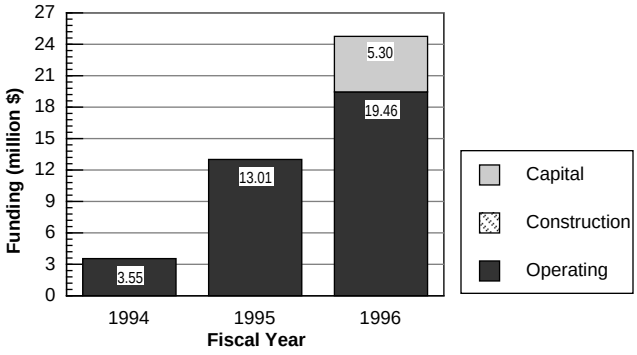
Principal Laboratory: LANL, SNL
Contributing Laboratories: LLNL
Participating Laboratories: ORNL

Mission Activity Description

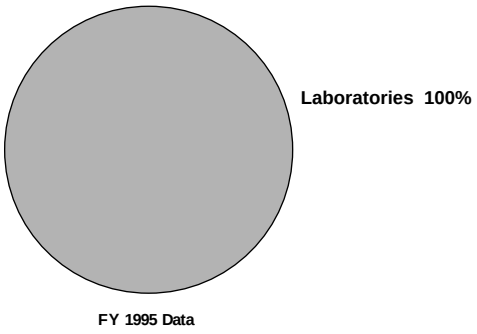
The Technical Integration, Support, and Associated Technologies element of the Fissile Materials Disposition Program provides systems engineering and laboratory/facility integration of technologies that are common to fissile material storage and disposition alternatives being evaluated by the Program. Some of the technologies contribute directly to the National Security Mission such as Safeguards & Security and nuclear weapon Pit Disassembly and Material Conversion. Others support program elements detailed in the Storage and Disposition Options tasks under the National Security Mission.

These technologies include: **Decision Analysis and Criteria** to provide the criteria and decision analysis methodology to evaluate and support the selection of potential disposition alternatives; **Systems Analysis** to define the system technology options and potential flow paths to be studied and coordinate the collection of data from candidate facilities and technologies to model the end-to-end performance of selected alternatives; **Safeguards and Security** to analyze domestic and international safeguards and security needs for the storage and disposition alternative analyses; **Technical Integration** to coordinate and integrate technical efforts laboratorywide; **Transportation and Packaging** to define issues and develop data input necessary to support material packaging requirements and offsite transportation between proposed facilities; **Automation and Robotics** to ensure that material disposition technologies are developed and evaluated with the consideration of appropriate automation and robotics technologies; **Pit Disassembly and Material Conversion** to develop methods to convert weapon pits into unclassified forms suitable for long-term storage and/or disposition options. The ARIES (Advanced Recovery and Integrated Extraction System) demonstration project, a joint LANL and LLNL effort, involves material technology and robotic systems for disassembling and converting nuclear weapon pits in a near zero waste manner.

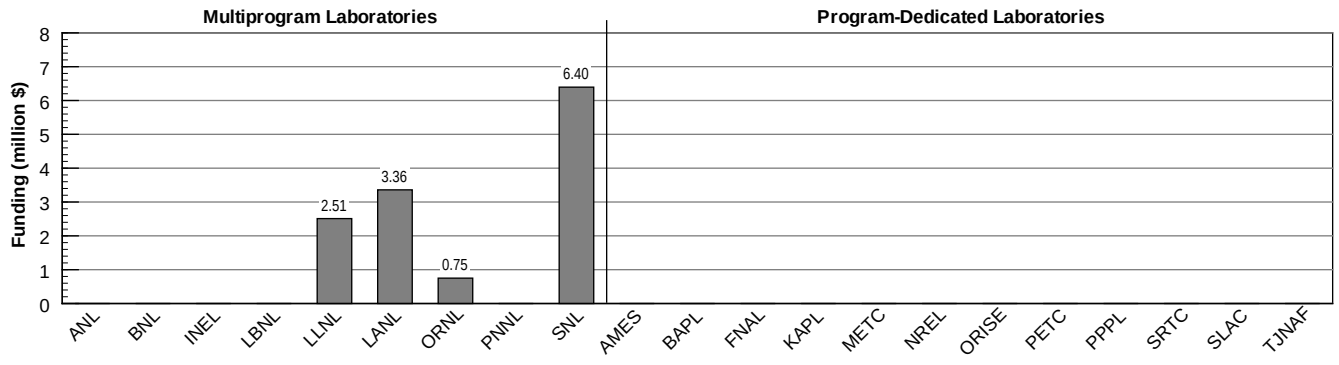
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Naval Reactor Development

Department of Energy Program

Program: Nuclear Energy
Office: Naval Nuclear Propulsion
Element: Naval Reactors Development
B&R Code: AJ0501, AJ050202, AJ050203, AJ050206, AJ0503, AJ0581, AJ20

Laboratory Complex

Principal Laboratories: BAPL
Contributing Laboratories: KAPL
Participating Laboratories: INEL

Mission Activity Description

Naval Reactors' mission is to provide the Navy with safe, militarily effective nuclear propulsion plants in keeping with the Nation's defense requirements and to ensure their continued safe and reliable operation. Naval Reactors is directly responsible for all aspects of naval nuclear propulsion from technology development through reactor operations to, ultimately, reactor plant disposal. The Navy will continue to rely on nuclear-powered warships, which comprise more than 40 percent of its major combatants. Activities include the following:

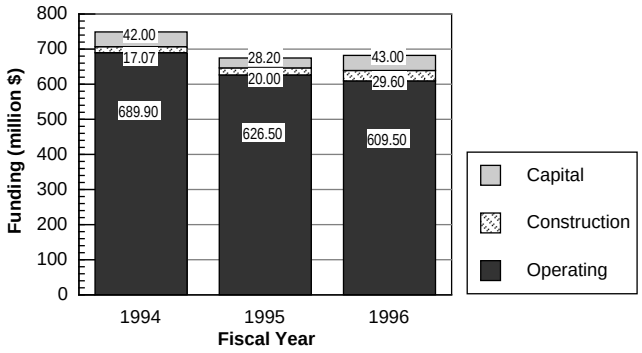
Reactor Technology and Analysis—Ensures continued safe and reliable operation of existing reactors and develops new reactors with improved power capabilities by exploiting advances in nuclear physics, reactor configuration, analytical modeling, and manufacturing and inspection methods.

Materials Development and Verification—Develops, qualifies, and tests nuclear fuel, poison, cladding, and structural and component materials suitable for use in the demanding environment of an operating nuclear plant. Materials must be capable of maintaining their structural and mechanical integrity over decades in a high-temperature, high-pressure, corrosive environment. Attention is given to testing and evaluating materials in use to verify acceptability for safe operation over a component's lifetime, to developing and applying new testing methods and insights, and to extending materials in use to new applications.

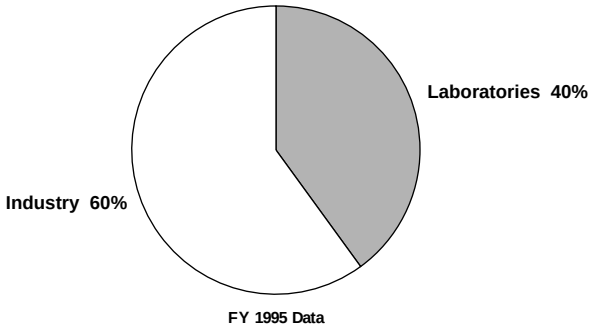
Plant Technology—Develops and analyzes equipment and systems that transfer, convert, store, control, and measure power created by the reactor. Work aims at maximizing plant performance and minimizing maintenance by evaluating existing components, integrating new technologies into current and new equipment designs, and proving concepts through testing.

Evaluation and Servicing—Operates, maintains, and services the program's land-based prototype naval nuclear propulsion plants and advanced test reactor plant. Testing of materials, components, cores, and systems in these plants provides important technical data and experience under actual operating conditions.

Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile