Science

Proposed Appropriation Language

For Department of Energy expenses including the purchase, construction and acquisition of plant and capital equipment, and other expenses necessary for science activities in carrying out the purposes of the Department of Energy Organization Act (42 U.S.C. 7101 et seq.), including the acquisition or condemnation of any real property or facility or for plant or facility acquisition, construction, or expansion, and purchase of not to exceed **[**four**]** *forty-seven* passenger motor vehicles for replacement only, including not to exceed one ambulance, **[**$3,628,902,000**]** *and not to exceed two buses, $3,462,718,000,* to remain available until expended. *(Energy and Water Development Appropriations Act, 2005.)*

Explanation of Change

Changes are proposed to reflect the FY 2006 funding and vehicle request.

Science
Office of Science
Overview
Appropriation Summary by Program

(dollars in thousands)

	FY 2004 Comparable Appropriation	FY 2005 Original Appropriation	FY 2005 Adjustments	FY 2005 Comparable Appropriation	FY 2006 Request
Science					
Basic Energy Sciences	991,262	1,113,530	-8,898[a]	1,104,632	1,146,017
Advanced Scientific Computing Research	196,795	234,340	-1,872[a]	232,468	207,055
Biological and Environmental Research	624,048	586,590	-4,678[a]	581,912	455,688
(One-time projects)	(136,798)	(80,250)	(-642)	(79,608)	(0)
(Other Biological and Environmental Research)	(487,250)	(506,340)	(-4,036)	(502,304)	(455,688)
High Energy Physics	716,170	742,380	-5,936[a]	736,444	713,933
Nuclear Physics	379,792	408,040	-3,262[a]	404,778	370,741
Fusion Energy Sciences	255,859	276,110	-2,207[a]	273,903	290,550
Science Laboratories Infrastructure	55,266	42,336	-338[a]	41,998	40,105
Science Program Direction	150,277[b]	155,268	-1,562[ab]	153,706	162,725
Workforce Development for Teachers and Scientists	6,432	7,660	-61[a]	7,599	7,192
Safeguards and Security	62,328	73,315	-542[a]	72,773	74,317
Small Business Innovation Research/Small Business Technology Transfer	114,915[c]	0	0	0	0
Subtotal, Science	3,553,144	3,639,569	-29,356	3,610,213	3,468,323
Less use of prior year balances	-11,173	-5,062	0	-5,062	0
Less security charge for reimbursable work	-5,598	-5,605	0	-5,605	-5,605
Total, Science	3,536,373	3,628,902	-29,356	3,599,546	3,462,718
(Total, excluding one-time projects)	(3,399,575)	(3,548,652)	(-28,714)	(3,519,938)	(3,462,718)

Preface

The Office of Science (SC) requests $3,462,718,000 for the Fiscal Year (FY) 2006 Science appropriation, a decrease of $136,828,000 from the FY 2005 appropriation, for investments in basic research that are critical to the success of Department of Energy (DOE) missions in national security and energy security; advancement of the frontiers of knowledge in the physical sciences and areas of biological, environmental, and computational sciences; and provision of world-class research facilities for the Nation's science enterprise.

The FY 2006 SC budget request supports the ITER and hydrogen fuel Presidential initiatives as well as other Administration priorities such as nanotechnology and climate change science research. ITER is funded within Fusion Energy Sciences (FES); the Hydrogen Fuel Initiative within Basic Energy

[a] Includes a rescission in accordance with P.L. 108-447, the Consolidated Appropriations Act, 2005.
[b] Includes a reduction of $313,000 in FY 2004 and $325,000 in FY 2005 for a comparability adjustment for FY 2006 savings from the A-76 Financial Services competition that are transferred to Departmental Administration.
[c] Includes $76,220,000 reprogrammed within SC and $38,695,000 transferred from other DOE programs.

Sciences (BES); nanotechnology within BES and Advanced Scientific Computing Research (ASCR); and climate change research within Biological and Environmental Research (BER).

Within the Science appropriation, SC has ten programs: ASCR, BES, BER, FES, High Energy Physics (HEP), Nuclear Physics (NP), Safeguards and Security (S&S), Science Laboratories Infrastructure (SLI), Workforce Development for Teachers and Scientists (WDTS), and Science Program Direction (SCPD).

This Overview will describe Strategic Context, Mission, Benefits, Strategic Goals, and Funding by General Goal. These items together put the appropriation request in perspective. The Annual Performance Results and Targets, Means and Strategies, and Validation and Verification sections address how the goals will be achieved and how performance will be measured. Finally, this Overview will address the Research and Development (R&D) Investment Criteria, Program Assessment Rating Tool (PART), and Significant Program Shifts.

Strategic Context

Following publication of the Administration's National Energy Policy, the Department developed a Strategic Plan that defines its mission, four strategic goals for accomplishing that mission, and seven general goals to support the strategic goals. Each appropriation has developed quantifiable goals to support the general goals. Thus, the "goal cascade" is the following:

Department Mission → Strategic Goal (25 yrs) → General Goal (10–15 yrs) → Program Goal (GPRA Unit) (10–15 yrs)

To provide a concrete link between budget, performance, and reporting, the Department developed a "GPRA Unit" concept. Within DOE, a GPRA Unit defines a major activity or group of activities that support the core mission and aligns resources with specific goals. Each GPRA Unit has completed or will complete a Program Assessment Rating Tool (PART). A unique program goal was developed for each GPRA unit. A numbering scheme has been established for tracking performance and reporting.

The goal cascade accomplishes two things. First, it ties major activities for each program to successive goals and, ultimately, to DOE's mission. This helps ensure the Department focuses its resources on fulfilling its mission. Second, the cascade allows DOE to track progress against quantifiable goals and to tie resources to each goal at any level in the cascade. Thus, the cascade facilitates the integration of budget and performance information in support of the GPRA and the President's Management Agenda (PMA).

Another important component of our strategic planning—and the President's Management Agenda—is use of the Administration's R&D investment criteria to plan and assess programs and projects. The criteria were developed in 2001 and further refined with input from agencies, Congressional staff, the National Academy of Sciences, and numerous private sector and nonprofit stakeholders.

The chief elements of the R&D investment criteria are quality, relevance, and performance. Programs must demonstrate fulfillment of these elements. For example, to demonstrate relevance, programs are expected to have complete plans with clear goals and priorities. To demonstrate quality, programs are expected to commission periodic independent expert reviews. There are several other requirements, many of which R&D programs have and continue to undertake.

An additional set of criteria were established for R&D programs developing technologies that address industry issues. Some key elements of the criteria include: the ability of the programs to articulate the appropriateness and need for Federal assistance; relevance to the industry and the marketplace; identification of a transition point to industry commercialization (or of an off-ramp if progress does not meet expectations); and the potential public benefits, compared to alternative investments, that may accrue if the technology is successfully deployed.

The OMB-OSTP guidance memo to agencies dated August 12, 2004, describes the R&D investment criteria fully and identifies steps agencies should take to fulfill them. (The memo is available on line at http://www.ostp.gov/html/m04-23.pdf.) Where appropriate throughout these justification materials specific R&D investment criteria and requirements are cited to explain the Department's allocation of resources.

Mission

SC's mission is to deliver the discoveries and scientific tools that transform our understanding of energy and matter and advance the national, economic, and energy security of the United States.

Benefits

SC represents an investment in our Nation's future. By providing support for key scientific disciplines, critical scientific tools, and the scientific workforce of today and tomorrow, we help to provide the foundation of our high-tech economy. The National Academies have stated that nearly half of all economic growth comes from investments in research. SC uses the principles of peer review, competition, transparency, and community involvement to guide our investments toward the most promising areas of science. We also look toward the future—not simply joining the latest trends but identifying emerging opportunities and pushing the limits of today's technology.

Our Strategic Plan and "Facilities for the Future of Science" 20-year outlook set an ambitious and clear agenda for scientific discovery over the next decade that reflects national priorities, the missions of the Department, and the views of the U.S. scientific community. Many of the fields we support count experiment time in years or even decades. In these areas, clear, consistent support is a key to success. Other areas change so rapidly that key publications are maintained electronically to keep pace. Flexibility is critical in these areas. Publishing long-range plans and priorities and implementing these through our annual budget request allows us to keep our research agenda clear and consistent while also being responsive to the changing opportunities at the forefront of research.

SC has proven its ability to deliver results over the past 50 years. That legacy includes 70 Nobel Laureates since 1954. Our science has spawned entire new industries, including nuclear medicine technologies that save thousands of lives each year, and the nuclear power industry that now contributes 20% of the power to our Nation's electricity grid. It has also changed the way we see the universe and ourselves; for example—by identifying the ubiquitous and mysterious "dark energy" that is accelerating the expansion of the universe and by sequencing the human genome. SC has taken the lead on new research challenges, such as bringing the power of terascale computing for scientific discovery and industrial competitiveness.

Strategic, General, and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The Science appropriation supports the following goal:

Science Strategic Goal: To protect our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge.

General Goal 5, World-Class Scientific Research Capacity: Provide world-class scientific research capacity needed to: ensure the success of Department missions in national and energy security; advance the frontiers of knowledge in physical sciences and areas of biological, medical, environmental, and computational sciences; or provide world-class research facilities for the Nation's science enterprise.

The programs funded by the Science appropriation have the following six Program Goals which contribute to General Goal 5 in the "goal cascade":

Program Goal 05.24.00.00: Bring the Power of the Stars to Earth—Answer the key scientific questions and overcome enormous technical challenges to harness the power that fuels our sun.

Program Goal 05.19.00.00: Explore the Fundamental Interactions of Energy, Matter, Time, and Space—Understand the unification of fundamental particles and forces and the mysterious forms of unseen energy and matter that dominate the universe, search for possible new dimensions of space, and investigate the nature of time itself.

Program Goal 05.20.00.00: Explore Nuclear Matter, from Quarks to Stars—Understand the evolution and structure of nuclear matter, from the smallest building blocks, quarks, and gluons; to the stable elements in the Universe created by stars; to unique isotopes created in the laboratory that exist at the limits of stability and possess radically different properties from known matter.

Program Goal 05.21.00.00: Harness the Power of Our Living World—Provide the biological and environmental discoveries necessary to clean and protect our environment, offer new energy alternatives, and fundamentally change the nature of medical care to improve human health.

Program Goal 05.22.00.00: Advance the Basic Science for Energy Independence—Provide the scientific knowledge and tools to achieve energy independence, securing U.S. leadership and essential breakthroughs in basic energy sciences.

Program Goal 05.23.00.00: Deliver Computing for Accelerated Progress in Science—Deliver forefront computational and networking capabilities to scientists nationwide that enable them to extend the frontiers of science, answering critical questions that range from the function of living cells to the power of fusion energy.

Contribution to General Goals

Six of the programs within the Science appropriation directly contribute to General Goal 5 as follows:

ASCR program contributes to General Goal 5 by significantly advancing scientific simulation and computation; applying new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future; by providing access to world-class scientific computation and networking facilities to the Nation's scientific community to support advancements in practically every field of science and industry; and by providing platforms for virtual prototypes to enhance economic competitiveness for U.S. industry. ASCR will continue to advance the transformation of scientific simulation and computation into the third pillar of scientific discovery, enabling scientists to look inside an atom or across a galaxy; and inside a chemical reaction that takes a millionth of a billionth of a second or across a climate change process that lasts for a thousand years. In addition, ASCR will shrink the distance between scientists and the resources—experiments, data, and other scientists—they need, and accelerate scientific discovery by taking simulation times from years to days to hours.

BES contributes to General Goal 5 by advancing nanoscale science through atomic- and molecular-level studies in materials sciences and engineering, chemistry, geosciences, and energy biosciences. BES also provides the Nation's researchers with world-class research facilities, including reactor and accelerator-based neutron sources, light sources including the X-ray free electron laser currently under construction, and micro-characterization centers. These facilities provide outstanding capabilities for imaging and characterizing materials of all kinds from metals, alloys, and ceramics to fragile biological samples. The next steps in the characterization and the ultimate control of materials properties and chemical reactivity are to improve spatial resolution of imaging techniques; to enable a wide variety of samples, sample sizes, and sample environments to be used in imaging experiments; and to make measurements on very short time scales, comparable to the time of a chemical reaction or the formation of a chemical bond. With these tools, we will be able to understand how the composition of materials affects their properties, to watch proteins fold, to see chemical reactions, and to understand and observe the nature of the chemical bond. Theory, modeling, and computer simulations will also play a major role in achieving these outcomes and will be a companion to experimental work. BES is also implementing the opportunities contained in the study "Basic Research Needs to Assure a Secure Energy Future." A first example is the support of basic research aimed at advancing hydrogen production, storage, and use for the coming hydrogen economy. A second is an assessment of the basic research needs for effective solar energy conversion to electricity or fuels.

BER contributes to General Goal 5 by advancing energy-related biological and environmental research in genomics and our understanding of complete biological systems, such as microbes that produce hydrogen; by developing models to predict climate over decades to centuries; by developing science-based methods for cleaning up environmental contaminants; by providing regulators with a stronger scientific basis for developing future radiation protection standards; and by conducting limited research in medical imaging, including radiopharmaceuticals.

FES contributes to General Goal 5 by advancing the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities. This includes: 1) exploring basic issues in plasma science; 2) developing the scientific basis and computational tools to predict the behavior of magnetically confined plasmas; 3) using the advances in tokamak research to enable the initiation of the burning plasma physics phase of the FES program; 4) exploring innovative confinement options that offer the potential of more attractive fusion energy sources in the long term; 5) focusing on the scientific issues of nonneutral plasma physics and High Energy Density Physics; and 6) developing the cutting edge technologies that enable fusion facilities to achieve their scientific goals. The research capabilities are essential to the construction and operation of ITER; described below. FES also contributes to General Goal 5 through participation in ITER, an experiment to study and demonstrate the sustained burning of fusion fuel. This proposed international collaboration will provide an unparalleled scientific research opportunity with a goal of demonstrating the scientific and technical feasibility of fusion power. ITER is a multi-billion dollar international research project that will, if successful, advance progress towards developing fusion's potential as a commercially viable and clean source of energy near the middle of the century.

The FY 2006 Budget provides for the start in mid-FY 2006 of a Major Item of Equipment (MIE) project entitled "U.S. Contributions to ITER." This title draws distinction between the international ITER project, in which the U.S. will be one of many participating parties, and the MIE, for which the U.S. has specific responsibilities. The Total Project Cost, including Total Estimated Cost (TEC) and Other Project Costs (OPC), for the U.S. Contributions to ITER MIE is provided in detail in the budget for the FES program.

HEP contributes to General Goal 5 by advancing understanding of the basic constituents of matter, dark energy and dark matter, the lack of symmetry between matter and antimatter in the current universe, and the possible existence of other dimensions, collectively revealing key secrets of the universe. HEP expands the energy frontier with particle accelerators to study fundamental interactions at the highest possible energies, which may reveal new particles, new forces, or undiscovered dimensions of space and time; explain the origin of mass; and illuminate the pathway to the underlying simplicity of the universe. At the same time, the HEP program sheds new light on other mysteries of the cosmos, uncovering what holds galaxies together and what is pushing the universe apart; understanding why there is any matter in the universe at all; and exposing how the tiniest constituents of the universe may have the largest role in shaping its birth, growth, and ultimate fate.

NP contributes to General Goal 5 by supporting innovative, peer- reviewed scientific research to advance knowledge and provide insights into the nature of energy and matter, and, in particular, to investigate the fundamental forces that hold the nucleus together and determine the detailed structure and behavior of the atomic nuclei. The program builds and operates world-leading scientific facilities and state-of-the-art instrumentation to study the evolution and structure of nuclear matter, from the smallest building blocks, quarks and gluons, to the stable elements in the Universe created by stars; to understand how the quarks and gluons combine to form the nucleons (proton and neutron), what the properties and behavior are of nuclear matter under extreme conditions of temperature and pressure, and what the properties and reaction rates are for atomic nuclei up to their limits of stability. Results and insight from these studies are relevant to understanding how the universe evolved in it earliest moments, how the chemical elements were formed, and how the properties of one of nature's basic constituents, the neutrino, influences astrophysics phenomena such as supernovae. Scientific discoveries at the frontiers of nuclear physics further the nation's energy-related research capacity, in turn providing for the nation's security, economic growth and opportunities, and improved quality of life.

Funding by General and Program Goal

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
General Goal 5, World-Class Scientific Research Capacity			
Program Goal 05.19.00.00, High Energy Physics	716,170	736,444	713,933
Program Goal 05.20.00.00, Nuclear Physics	379,792	404,778	370,741
Program Goal 05.21.00.00, Biological and Environmental Research	624,048	581,912	455,688
Program Goal 05.22.00.00, Basic Energy Sciences	991,262	1,104,632	1,146,017
Program Goal 05.23.00.00, Advanced Scientific Computing Research	196,795	232,468	207,055
Program Goal 05.24.00.00, Fusion Energy Sciences	255,859	273,903	290,550
Subtotal, General Goal 5, World-Class Scientific Research Capacity	3,163,926	3,334,137	3,183,984
All Other			
Science Laboratories Infrastructure	55,266	41,998	40,105
Program Direction	150,277	153,706	162,725
Workforce Development for Teachers and Scientists	6,432	7,599	7,192
Safeguards and Security	62,328	72,773	74,317
Small Business Innovation Research/Small Business Technology Transfer	114,915	0	0
Total, All Other	389,218	276,076	284,339
Total, General Goal 5 (Science)	3,553,144	3,610,213	3,468,323

Major FY 2004 Accomplishments

The 2003 Nobel Prize for Physics was shared by an Argonne National Laboratory researcher for pioneering contributions to the theory of superconductors. SC has long supported this work on the mechanisms of high temperature superconductivity. Amongst the myriad applications of superconducting materials are the magnets used for magnetic resonance imaging, or MRI, and potential applications in high efficiency electricity transmission and high-speed trains.

The 2004 Nobel Prize in Physics was awarded to three researchers (from MIT, University of California at Santa Barbara, and Caltech) for their discovery of "asymptotic freedom" in the theory of strong interactions, Quantum ChromoDynamics (QCD). This is the force that holds protons together. Their theoretical work was decisive in understanding one of Nature's fundamental forces and made it possible to complete the Standard Model of Particle Physics, the model that describes the smallest objects in Nature and how they interact. Two of the three researchers have been supported by the HEP program for many years.

In 2004, the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory (BNL) delivered gold beams at twice the accelerator design limits and greatly exceeded the expectations of the 1,000-plus international physicists working on the four experiments at RHIC. The goal of RHIC is to recreate the predicted quark-gluon plasma, an extremely dense state of matter thought to have last existed microseconds after the Big Bang. The RHIC data have revealed evidence of a new state of matter, however, with properties which indicate that it is strongly interacting – something new and unexpected – as well as possible evidence of another state of matter, called the "color glass condensate."

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by the Office of Management and Budget (OMB) to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews.

The current focus is to establish outcome- and output-oriented goals, the successful completion of which will lead to benefits to the public, such as increased national security and energy security, and improved environmental conditions. DOE has incorporated feedback from OMB into the FY 2006 Budget Request, and the Department will take the necessary steps to continue to improve performance.

SC did not complete PARTs for the FY 2006 Budget. In the FY 2005 PART review, OMB assessed six SC programs: ASCR, BES, BER, FES, HEP, and NP. Program scores ranged from 82-93%. Three programs—BES, BER, and NP—were assessed "Effective." Three programs—ASCR, FES, and HEP—were assessed "Moderately Effective." The full PARTs are available on the OMB website at http://www.whitehouse.gov/omb/budget/fy2005/part.html.

A Committee of Visitors (COV) is a panel of outside experts who review a program's portfolio for quality and consistent application of business practices. Based on the success of the COV formed by the BES program, and as subsequently recommended by OMB in the FY 2005 PART findings, SC has established COVs for all six research programs. Each of these COVs conducted at least one review by the end of FY 2004. These COVs have been formed under the auspices of the programs' Scientific Advisory Committees. Charge letters and reports for the COVs are on the SC website at http://www.science.doe.gov/measures/cov.html.

In addition, SC has taken steps to enhance public understanding of our revised performance measures. A PART website (http://www.science.doe.gov/measures/) has been developed to better explain what each scientific measure means, why it is important to the Department and/or the research community, and how progress will be measured. Roadmaps with more detailed information on tracking progress toward the long-term measures have been developed with the Scientific Advisory Committees and will be posted to this PART website. The Advisory Committees will review progress toward those measures vis-à-vis the roadmaps every 3 to 5 years. The first reviews will be conducted in FY 2007. The results of these reviews will be published on the PART website as they become available.

Significant Program Shifts

SC is ready to meet the challenges of today. We have established clear research priorities for the present and for the next decade. We have identified the key research facilities our Nation needs to build to maintain scientific excellence. We will restructure our workforce and our business practices to achieve greater efficiencies and economies of scale that will improve the performance of the 10 national laboratories that we manage. This budget request fully supports the SC workforce. Tough decisions have been made, but we are confident that the investments we propose are among the very best that science has to offer and are sound investments in our Nation's future.

In keeping with the R&D Investment Criteria's commitment to excellence through peer reviewed competition, ASCR will recompete major elements of its portfolio related to Scientific Discovery through Advanced Computing (SciDAC) in FY 2006, with attention paid to support for the long-term maintenance and support of software tools such as mathematical libraries, adaptive mesh refinement software, and scientific data management tools developed in the first 5 years of the effort. In addition, in FY 2006, ASCR is changing the way in which it manages its Genomics: GTL partnership with BER. The management of these efforts will be integrated into the portfolio of successful SciDAC partnerships. The FY 2006 budget request includes $7,500,000 for continued support of the Genomics: GTL research program, in partnership with BER; $2,600,000 for the Nanoscale Science, Engineering and Technology initiative led by the BES program; $1,350,000 for support of the Fusion Simulation Project, led by the FES program; and $8,500,000 to continue "Atomic to Macroscopic Mathematics" research support in applied mathematics needed to break through the current barriers in our understanding of complex physics processes that occur on a wide range of interacting length- and time-scales. Finally, in FY 2006 ASCR will initiate a small number of competitively selected SciDAC institutes at universities which can become centers of excellence in high end computational science in areas that are critical to DOE missions at a total funding level of $8,000,000. In keeping with the principles of the PART, the research effort in Collaboratory Tools and Pilots and Networking will be restructured into an integrated Distributed Network Environment activity focused on basic research in computer networks and the middleware needed to make these networks tools for science. The efficiencies achieved through this restructuring will enable the Next Generation Architecture (NGA) effort to operate computers, such as the 20 teraflop Cray X1e and Cray Red Storm system acquired in FY 2004 and FY 2005 at the Center for Computational Sciences (CCS) at the Oak Ridge National Laboratory (ORNL), as tools for science and especially to satisfy the demand for resources that has resulted from the successful SciDAC efforts. In addition, the NGA activity initiates a new competition for Research and Evaluation (R&E) prototype computer testbeds to enable SciDAC teams to evaluate the potential of future architectures. NGA will continue its focus on research in operating systems and systems software. These efforts are aligned with the plan developed by the National Science and Technology Council (NSTC). These efforts will play a critical role in enabling Leadership Class Machines that could lead to solutions for scientific and industrial problems beyond what would be attainable through a continued simple extrapolation of current computational capabilities. This area has been identified as a priority within the overall Networking and Information Technology Research and Development (NITR&D) priorities of the

Administration. Core funding for university and national laboratory researchers decreases 11.9% compared to the FY 2005 appropriation.

In BES, FY 2006 marks the completion of construction and the initial operation of the Spallation Neutron Source. Operations will also begin at four of the five Nanoscale Science Research Centers (NSRCs) with the exception being the Center for Functional Nanomaterials at BNL, which is scheduled to begin operations in FY 2008. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale. The NSRCs are designed to promote rapid advances in the various areas of nanoscale science and technology and are part of the DOE contribution to the National Nanotechnology Initiative. The Linac Coherent Light Source (LCLS) will continue Project Engineering Design (PED) and will begin construction at the planned levels. Funding will be provided separately for preconceptual design of instruments for the facility. Funding will also be provided to partially support operation of the Stanford Linear Accelerator Center (SLAC) linac. This will mark the beginning of the transition to LCLS operations at SLAC. This new facility will open entirely new realms of discovery in the chemical, materials, and biological sciences. Pioneering developments of aberration-correcting electron optics have created the unprecedented opportunity to directly observe the atomic-scale order, electronic structure, and dynamics of individual nanoscale structures by advanced transmission electron microscopy. The FY 2006 budget supports an MIE for the Transmission Electron Aberration-corrected Microscope (TEAM). All BES construction projects are reviewed and monitored via an R&D Investment Criteria best practice for performance. To maintain progress toward a PART long-term goal, research to realize the potential of a hydrogen economy will be increased from $29,183,000 to $32,500,000. This research program is based on the BES workshop report Basic Research Needs for the Hydrogen Economy. Operations at the Radiochemical Engineering and Development Center at ORNL will be terminated. The operations budgets of the remaining facilities will be at about the same level as in FY 2005, decreasing available beam time and service for users. Core funding for university and national laboratory researchers decreases 7.8% compared to the FY 2005 appropriation. While no research activities will be terminated, there will be reductions throughout.

BER is investigating the potential for a new generation of sophisticated high-throughput genomics technologies, making them widely and readily available, and using them effectively to serve the community of national laboratories, and academic and industrial researchers. In keeping with the relevance principles in the R&D Investment Criteria, the Biological and Environmental Research Advisory Committee (BERAC) has confirmed that these Genomics: GTL facilities are highly relevant to the mission of BER and the goals of the research community. A high-level National Academies Study will be commissioned in FY 2005 to assess the scientific case for the Genomics: GTL effort as it relates to DOE core missions. Research to underpin the development and design of the technologies to be incorporated into the proposed Genomics: GTL Facility for the Production and Characterization of Proteins and Molecular Tags is currently being funded as part of the Genomics: GTL program. The Ethical, Legal, and Societal Issues program will include activities applicable to biotechnology and nanotechnology in cooperation with other SC programs. Moving the management of the National Institute for Global Environmental Change (NIGEC) from the University of California at Davis to BER will increase performance by reducing overhead costs and freeing up funds to support additional research that is highly relevant to DOE missions. This action has been confirmed by the BERAC COV, called for in the PART, for the Climate Change Research program. The number of NIGEC regional centers will also be reduced from six to four by holding an open competition for the four centers in keeping with the excellence principles of the R&D Investment Criteria. Based on their relevance to the BER long-term goals and higher BER priorities, funding reductions are initiated in the Medical Applications and Measurement Science Research subprogram which is refocused on advanced medical imaging technology, including radiopharmaceuticals for imaging, and on the Artificial Retina. Based on the BERAC COV findings for the Environmental Remediation Research subprogram, the research activities are integrated into a single program to increase the efficiency of the activities and better address the BER long-term goals in environmental remediation research. Core funding for university and national laboratory researchers decreases 10.2% compared to the FY 2005 appropriation.

In FES, the FY 2006 budget continues the redirection of the fusion program to prepare for and participate in the ITER program—an initiative taken at Presidential direction. Operation of the three major fusion research facilities will be reduced from a total of 48 weeks to 17 weeks. The TEC for the National Compact Stellarator Experiment (NCSX) increases. Other program shifts include reduction of the Inertial Fusion Energy/High Energy Density Physics program from the FY 2005 level. In addition, the Materials Research program will be eliminated in favor of reliance upon the general BES materials effort for U.S. scientific advances in areas of fusion interest. Overall, core funding for university, industry, and national laboratory researchers decreases by 12.8% compared to the FY 2005 appropriation. The FY 2006 request for the U.S. Contributions to ITER MIE is summarized in the following table.

U.S. Contributions to ITER
Annual Profile

(budget authority in thousands)

Fiscal Year	Total Estimated Cost	Other Project Costs	Total Project Cost
2006	46,000	3,500	49,500
2007	130,000	16,000	146,000
2008	182,000	18,800	200,800
2009	191,000	16,500	207,500
2010	189,000	10,300	199,300
2011	151,000	9,300	160,300
2012	120,000	6,200	126,200
2013	29,000	3,400	32,400
Total	1,038,000	84,000	1,122,000

Because of its broad relevance in addressing many of the long-term goals of HEP, and its unique potential for new discoveries, the highest priority is given to the planned operations for the Tevatron program at Fermi National Accelerator Laboratory, including fully funded upgrades and infrastructure support. To fully exploit the unique opportunity to expand our understanding of the asymmetry of matter and anti-matter in the universe, a high priority is given to the operations for the B-factory at SLAC, including an allowance for increased power costs, associated upgrades, and infrastructure support. With its great potential for discoveries, such as understanding of the origin of mass, support of a leadership role for U.S. research groups in the Large Hadron Collider (LHC) physics program will be a high priority. As the LHC accelerator in Geneva, Switzerland nears its turn-on, U.S. activities related to fabrication of detector and accelerator components will be completed and new activities related to commissioning, pre-operations, and software and computing will ramp-up significantly. Given the schedule and funding constraints, the BTeV ("B Physics at the Tevatron") experiment, which was planned in FY 2005 as a new MIE, will be terminated by end of FY 2005. This is consistent with the guidance of the High Energy Physics Advisory Panel (HEPAP), which supported BTeV, but only if it could be completed by FY 2010. To explore the nature of dark energy, R&D for potential interagency experiments with the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) will continue in FY 2006. To address the opportunity for significant new future research options, R&D in support of an international electron-positron linear collider is increased. To provide a nearer-term future program, and preserve future research options, R&D for other new accelerator and detector technologies, particularly in the emerging area of neutrino physics, will increase in FY 2006. Core funding for university and national laboratory researchers is about the same as the FY 2005 appropriation.

In NP, the FY 2006 budget request maintains the scientific scope of the nation's nuclear physics program. In keeping with PART findings and principles, termination of operations of the MIT/Bates facility in FY 2005 will allow resources for the remaining user facilities: the RHIC at BNL, the Continuous Electron Beam Accelerator Facility (CEBAF) at the Thomas Jefferson National Accelerator Laboratory (TJNAF), and the Argonne Tandem Linear Accelerator System (ATLAS) and Holifield Radioactive Ion Beam Facility (HRIBF) at ORNL. Operations at these facilities will be at about 65% of optimum utilization. Investments are made in capabilities at these facilities to extract the desired science and to improve efficiencies in the outyears. The R&D Investment Criteria's relevance principles recommend utilizing community planning in establishing program priorities. FY 2006 funding for capital equipment will address opportunities identified in the 2002 Nuclear Science Advisory Committee (NSAC) Long Range Plan and subsequent NSAC recommendations. At RHIC, funding is provided for needed detector upgrades, redirecting modest funds available for operations of the facility and existing detectors. At TJNAF, funding is provided for 12 GeV CEBAF Upgrade R&D and conceptual design activities. At ATLAS and HRIBF, the priority is on emphasizing facility operations within available funds. The research programs at the major user facilities are integrated partnerships between DOE scientific laboratories and the university community, and the planned experimental research activities are considered essential for scientific productivity of the facilities. Core funding for university and national laboratory researchers decreases 9.3% compared to the FY 2005 appropriation. R&D activities for the proposed Rare Isotope Accelerator (RIA) are maintained at the FY 2005 Presidential Request level.

The purpose of the S&S program is to ensure appropriate levels of protection against unauthorized access, theft, diversion, loss of custody or destruction of DOE assets, and hostile acts that may cause adverse impacts on fundamental science, national security, or the health and safety of DOE and contractor employees, the public, or the environment. In FY 2006, small increases in funding are primarily for security systems for reconfiguration and improvements of entry points at BNL and SLAC and for revised Design Basis Threat needs primarily at ORNL.

The SLI mission is to enable the conduct of Departmental research missions at the ten SC laboratories and the Oak Ridge Institute for Science and Education (ORISE) by funding line item construction to maintain the general purpose infrastructure and the clean-up and removal of excess facilities. The program also supports SC landlord responsibilities for the 34,000 acre Oak Ridge Reservation; provides Payment in Lieu of Taxes (PILT); and provides for the correction of Occupational Safety and Health Administration (OSHA) and Nuclear Regulatory Commission identified deficiencies and implementation of recommendations for improved health and safety practices at SC laboratories. In FY 2006, the SLI program will initiate the clean-up and removal of the retired Bevatron accelerator at the Lawrence Berkeley National Laboratory.

The SCPD mission is to provide a Federal workforce, skilled and highly motivated, to manage and support basic energy and science-related research disciplines, diversely supported through research programs, projects, and facilities under the SC's leadership. Rollout of Phase 1 of the SC restructuring initiative (OneSC) was announced in March 2004. The new SC structure improves organizational and functional alignment, reporting relationships (by reducing layers of management), streamlining decision-making processes, clarifying lines of authority, and making better use of resources. Phase 2 of OneSC will occur over the next 24 months and involves human capital and organizational analyses and reengineering of SC business and management operations and processes. This phase will optimize SC business practices, take unnecessary work out of the system, enable the federal workforce to be more productive, support improved laboratory contractor performance, and ultimately drive down the cost of doing business in both federal and contractor operations. This project embraces the changes envisioned by the PMA to manage government programs more economically and effectively.

WDTS will run Laboratory Science Teacher Professional Development (LSTPD) activities at five or more DOE national laboratories with about 105 participating teachers, in response to the national need for science teachers who have strong content knowledge in the classes they teach. FY 2006 represents the third year of this program and 15 new teachers will be supported, in addition to the 90 teachers already part-way through this 3-year program. The Faculty Sabbatical activity, which begins in FY 2005 for 12 faculty members from Minority Serving Institutions, will have 5 positions available in FY 2006. The Pre-Service Teachers activity will be run at one national laboratory, and students will be recruited from participating NSF programs. On July 8, 2004, DOE announced the STARS education initiative to promote science literacy and help develop the next generation of scientists and engineers. In support of this effort, there is additional funding to both the LSTPD activity and to the Middle School Science Bowl. The components of the STARS that involve educational outreach by national laboratory scientists and engineers to middle school students will be executed by the national laboratories through their respective workforce development/education offices.

Institutional General Plant Projects

Institutional General Plant Projects (IGPPs) are miscellaneous construction projects that are each less than $5,000,000 in TEC and are of a general nature (cannot be allocated to a specific program). IGPPs support multi-programmatic and/or inter-disciplinary programs and are funded through site overhead. Examples of acceptable IGPPs include site-wide maintenance facilities and utilities, such as roads and grounds out side the plant fences or a telephone switch that serves the entire facility.

Examples of prior year and current year projects are:

- Building 1506 Renovation at ORNL. This FY 2003 and FY 2004 effort included structural upgrades to comply with DOE and international codes; greenhouse replacements; laboratory reconfigurations; and heating, ventilation and air conditioning (HVAC) modifications. TEC: $3,150,000.
- East Campus Entry and Parking design and construction at ORNL. This effort, initiated in FY 2003, includes construction of a new 25,000 square foot parking court for approximately 60 cars and a 20,000 square foot terrace area with seating and informal gathering areas. TEC: $2,467,000.
- Quadrangle Common Area design and construction at ORNL. This FY 2004 and FY 2005 effort includes lawn, landscaping, sidewalks, lighting, and street improvements to an area of approximately 71,000 square feet. TEC: $2,697,000.
- 5000 Area Utility Systems Upgrade at ORNL. This FY 2005 project will provide utility services (i.e., natural gas, potable water, and sanitary sewer) for the East Campus area to support new third party development. TEC: $325,000.
- Horn Rapids Triangle Utilities Infrastructure at the Pacific Northwest National Laboratory. This FY 2005 and FY 2006 project will provide the needed site utility infrastructure to support the

proposed construction of new lab and office facilities to replace 300 Area facilities which will be demolished. Area to be developed is approximately 70 acres. TEC: $3,500,000.

The following displays IGPP funding by site:

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
Oak Ridge National Laboratory	6,000	8,000	8,000	0	0.0%
Pacific Northwest National Laboratory	500	5,000	5,000	0	0.0%
Total, IGPP	6,500	13,000	13,000	0	0.0%

Selected Office of Science Activities

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
Hydrogen Initiative	7,710	29,183	32,500	+3,317	+11.4%
Genomics: GTL	73,177	84,984	94,686	+9,702	+11.4%
Climate Change Science Program	129,328	128,570	132,109	+3,539	+2.8%
High Performance Computing and Communications	213,035	252,932	227,434	-25,498	-10.1%
Nanoscience Engineering and Technology	201,582	210,415	207,481	-2,934	-1.4%
ITER	0	0	49,500	+49,500	--

Science
Office of Science
Funding by Site by Program

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Ames Site Office					
Ames Laboratory					
Basic Energy Sciences	21,050	19,921	19,274	-647	-3.2%
Advanced Scientific Computing Research	2,232	1,409	1,227	-182	-12.9%
Biological and Environmental Research	1,005	400	0	-400	-100.0%
Science Laboratories Infrastructure	425	210	45	-165	-78.6%
Safeguards and Security	409	505	505	0	0.0%
Workforce Development for Teachers and Scientists	0	65	65	0	0.0%
Total, Ames Laboratory	25,121	22,510	21,116	-1,394	-6.2%
Ames Site Office					
Science Program Direction	355	443	453	+10	+2.3%
Total, Ames Site Office	25,476	22,953	21,569	-1,384	-6.0%
Argonne Site Office					
Argonne National Laboratory – East					
Basic Energy Sciences	175,280	174,714	182,213	+7,499	+4.3%
Advanced Scientific Computing Research	12,696	12,733	8,319	-4,414	-34.7%
Biological and Environmental Research	27,595	26,884	27,154	+270	+1.0%
High Energy Physics	10,491	10,162	9,989	-173	-1.7%
Nuclear Physics	20,242	19,710	17,749	-1,961	-9.9%
Fusion Energy Sciences	1,015	971	970	-1	-0.1%
Science Laboratories Infrastructure	6,921	2,235	770	-1,465	-65.5%
Workforce Development for Teachers and Scientists	1,913	867	2,483	+1,616	+186.4%
Safeguards and Security	7,655	8,727	8,984	+257	+2.9%
Total, Argonne National Laboratory	263,808	257,003	258,631	+1,628	+0.6%
Argonne Site Office					
Science Program Direction	2,990	3,596	3,677	+81	+2.3%
Total, Argonne Site Office	266,798	260,599	262,308	+1,709	+0.7%

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Berkeley Site Office					
Lawrence Berkeley National Laboratory					
Basic Energy Sciences	126,172	123,828	105,113	-18,715	-15.1%
Advanced Scientific Computing Research	63,934	69,268	63,783	-5,485	-7.9%
Biological and Environmental Research	75,417	68,444	59,974	-8,470	-12.4%
High Energy Physics	43,439	40,131	39,300	-831	-2.1%
Nuclear Physics	18,236	17,350	17,437	+87	+0.5%
Fusion Energy Sciences	5,842	6,112	2,613	-3,499	-57.2%
Science Laboratories Infrastructure	4,455	8,199	14,826	+6,627	+80.8%
Workforce Development for Teachers and Scientists	773	454	638	+184	+40.5%
Safeguards and Security	4,689	5,785	5,205	-580	-10.0%
Total, Lawrence Berkeley National Laboratory	342,957	339,571	308,889	-30,682	-9.0%
Berkeley Site Office					
Science Program Direction	2,433	3,302	3,305	+3	+0.1%
Total, Berkeley Site Office	345,390	342,873	312,194	-30,679	-8.9%
Brookhaven Site Office					
Brookhaven National Laboratory					
Basic Energy Sciences	69,842	83,720	100,844	+17,124	+20.5%
Advanced Scientific Computing Research	2,340	1,000	670	-330	-33.0%
Biological and Environmental Research	21,344	21,246	17,171	-4,075	-19.2%
High Energy Physics	30,456	29,459	29,041	-418	-1.4%
Nuclear Physics	149,626	157,086	148,150	-8,936	-5.7%
Science Laboratories Infrastructure	6,978	7,706	4,246	-3,460	-44.9%
Workforce Development for Teachers and Scientists	538	464	683	+219	+47.2%
Safeguards and Security	10,760	11,335	11,776	+441	+3.9%
Total, Brookhaven National Laboratory	291,884	312,016	312,581	+565	+0.2%
Brookhaven Site Office					
Science Program Direction	2,960	3,456	3,537	+81	+2.3%
Total, Brookhaven Site Office	294,844	315,472	316,118	+646	+0.2%

	FY 2004	FY 2005	FY 2006	$ Change	% Change
	(dollars in thousands)				
Chicago Office					
Basic Energy Sciences	157,563	123,914	137,220	+13,306	+10.7%
Advanced Scientific Computing Research	34,718	31,489	25,119	-6,370	-20.2%
Biological and Environmental Research	278,248	114,422	87,339	-27,083	-23.7%
High Energy Physics	124,964	118,719	112,047	-6,672	-5.6%
Nuclear Physics	73,128	69,385	58,612	-10,773	-15.5%
Fusion Energy Sciences	125,596	131,797	125,581	-6,216	-4.7%
Science Laboratories Infrastructure	1,057	1,520	1,520	0	0.0%
Science Program Direction	23,991	23,979	25,406	+1,427	+6.0%
Workforce Development for Teachers and Scientists	2	0	15	+15	--
Small Business Innovation Research/Small Business Technology Transfer	114,915	0	0	0	0.0%
Total, Chicago Office	934,182	615,225	572,859	-42,366	-6.9%
Fermi Site Office					
Fermi National Accelerator Laboratory					
Advanced Scientific Computing Research	646	646	200	-446	-69.0%
High Energy Physics	311,764	303,608	304,163	+555	+0.2%
Nuclear Physics	43	0	0	0	0.0%
Science Laboratories Infrastructure	633	662	125	-537	-81.1%
Workforce Development for Teachers and Scientists	70	62	50	-12	-19.4%
Safeguards and Security	2,837	3,067	3,067	0	0.0%
Total, Fermi National Accelerator Laboratory	315,993	308,045	307,605	-440	-0.1%
Fermi Site Office					
Science Program Direction	2,175	2,189	2,235	+46	+2.1%
Total, Fermi Site Office	318,168	310,234	309,840	-394	-0.1%
Idaho Operations Office					
Idaho National Laboratory					
Basic Energy Sciences	1,142	253	555	+302	+119.4%
Biological and Environmental Research	4,555	3,645	2,250	-1,395	-38.3%
Fusion Energy Sciences	2,108	2,469	2,272	-197	-8.0%
Workforce Development for Teachers and Scientists	90	76	50	-26	-34.2%
Total, Idaho National Laboratory	7,895	6,443	5,127	-1,316	-20.4%
Idaho Operations Office					
Biological and Environmental Research	5,336	1,123	0	-1,123	-100.0%
Total, Idaho Operations Office	13,231	7,566	5,127	-2,439	-32.2%

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Livermore Site Office					
Lawrence Livermore National Laboratory					
Basic Energy Sciences	4,612	3,055	2,382	-673	-22.0%
Advanced Scientific Computing Research	5,657	6,187	3,843	-2,344	-37.9%
Biological and Environmental Research	22,391	23,183	22,352	-831	-3.6%
High Energy Physics	2,295	1,270	436	-834	-65.7%
Nuclear Physics	1,002	665	552	-113	-17.0%
Fusion Energy Sciences	14,431	13,503	9,159	-4,344	-32.2%
Science Laboratories Infrastructure	250	150	150	0	0.0%
Workforce Development for Teachers and Scientists	0	50	50	0	0.0%
Total, Livermore Site Office	50,638	48,063	38,924	-9,139	-19.0%
Los Alamos Site Office					
Los Alamos National Laboratory					
Basic Energy Sciences	33,664	28,924	24,406	-4,518	-15.6%
Advanced Scientific Computing Research	3,688	3,590	3,260	-330	-9.2%
Biological and Environmental Research	23,700	19,178	17,331	-1,847	-9.6%
High Energy Physics	785	570	825	+255	+44.7%
Nuclear Physics	10,080	9,081	7,953	-1,128	-12.4%
Fusion Energy Sciences	3,923	3,481	3,224	-257	-7.4%
Workforce Development for Teachers and Scientists	0	50	50	0	0.0%
Total, Los Alamos Site Office	75,840	64,874	57,049	-7,825	-12.1%
NNSA Service Center/Albuquerque					
Golden Field Office					
Workforce Development for Teachers and Scientists	359	296	380	+84	+28.4%
National Renewable Energy Laboratory					
Basic Energy Sciences	5,905	6,115	5,452	-663	-10.8%
Advanced Scientific Computing Research	150	150	150	0	0.0%
Biological and Environmental Research	25	400	0	-400	-100.0%
Total, National Renewable Energy Laboratory	6,080	6,665	5,602	-1,063	-15.9%
NNSA Service Center/Albuquerque					
Biological and Environmental Research	850	850	800	-50	-5.9%
Total, NNSA Service Center/Albuquerque	7,289	7,811	6,782	-1,029	-13.2%
NNSA Service Center/Oakland					
Fusion Energy Sciences	2,414	0	0	0	0.0%

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Oak Ridge Office					
Oak Ridge Institute for Science and Education					
Basic Energy Sciences	1,503	538	1,251	+713	+132.5%
Advanced Scientific Computing Research	565	250	250	0	0.0%
Biological and Environmental Research	4,410	4,628	3,675	-953	-20.6%
High Energy Physics	180	0	135	+135	--
Nuclear Physics	1,033	662	646	-16	-2.4%
Fusion Energy Sciences	1,086	1,189	1,228	+39	+3.3%
Science Laboratories Infrastructure	0	565	768	+203	+35.9%
Workforce Development for Teachers and Scientists	1,148	1,164	1,239	+75	+6.4%
Safeguards and Security	1,179	1,410	1,460	+50	+3.5%
Total, Oak Ridge Institute for Science and Education	11,104	10,406	10,652	+246	+2.4%
Oak Ridge National Laboratory					
Basic Energy Sciences	285,371	257,081	278,743	+21,662	+8.4%
Advanced Scientific Computing Research	52,902	67,052	30,937	-36,115	-53.9%
Biological and Environmental Research	47,093	41,529	33,175	-8,354	-20.1%
High Energy Physics	731	220	627	+407	+185.0%
Nuclear Physics	21,598	20,157	19,700	-457	-2.3%
Fusion Energy Sciences	22,506	20,727	15,782	-4,945	-23.9%
Science Laboratories Infrastructure	15,360	2,179	1,133	-1,046	-48.0%
Safeguards and Security	7,004	11,997	12,485	+488	+4.1%
Total, Oak Ridge National Laboratory	452,565	420,942	392,582	-28,360	-6.7%
Oak Ridge Office					
Basic Energy Sciences	123	106	0	-106	-100.0%
Advanced Scientific Computing Research	116	116	116	0	0.0%
Biological and Environmental Research	815	694	703	+9	+1.3%
High Energy Physics	122	106	0	-106	-100.0%
Nuclear Physics	167	106	0	-106	-100.0%
Fusion Energy Sciences	16	106	0	-106	-100.0%
Science Laboratories Infrastructure	5,049	5,039	5,079	+40	+0.8%
Science Program Direction	41,290	41,922	43,758	+1,836	+4.4%
Workforce Development for Teachers and Scientists	80	90	90	0	0.0%
Safeguards and Security	11,718	12,858	13,705	+847	+6.6%
Total, Oak Ridge Office	59,496	61,143	63,451	+2,308	+3.8%
Total, Oak Ridge Office	523,165	492,491	466,685	-25,806	-5.2%

(dollars in thousands)	FY 2004	FY 2005	FY 2006	$ Change	% Change
Pacific Northwest Site Office					
Pacific Northwest National Laboratory					
Basic Energy Sciences	14,018	13,345	13,429	+84	+0.6%
Advanced Scientific Computing Research	4,568	2,616	1,126	-1,490	-57.0%
Biological and Environmental Research	89,893	84,319	82,114	-2,205	-2.6%
Nuclear Physics	70	0	0	0	0.0%
Fusion Energy Sciences	1,380	1,314	0	-1,314	-100.0%
Science Laboratories Infrastructure	1	4,960	3,000	-1,960	-39.5%
Workforce Development for Teachers and Scientists	940	574	761	+187	+32.6%
Safeguards and Security	10,721	10,985	11,070	+85	+0.8%
Total, Pacific Northwest National Laboratory	121,591	118,113	111,500	-6,613	-5.6%
Pacific Northwest Site Office					
Science Program Direction	4,245	5,277	5,438	+161	+3.1%
Total, Pacific Northwest Site Office	125,836	123,390	116,938	-6,452	-5.2%
Princeton Site Office					
Princeton Plasma Physics Laboratory					
Advanced Scientific Computing Research	225	531	306	-225	-42.4%
High Energy Physics	225	225	225	0	0.0%
Fusion Energy Sciences	71,546	74,191	113,280	+39,089	+52.7%
Science Laboratories Infrastructure	1,580	184	0	-184	-100.0%
Workforce Development for Teachers and Scientists	80	134	100	-34	-25.4%
Safeguards and Security	1,855	1,945	1,945	0	0.0%
Total, Princeton Plasma Physics Laboratory	75,511	77,210	115,856	+38,646	+50.1%
Princeton Site Office					
Science Program Direction	1,505	1,583	1,618	+35	+2.2%
Total, Princeton Site Office	77,016	78,793	117,474	+38,681	+49.1%
Sandia Site Office					
Sandia National Laboratories					
Basic Energy Sciences	47,885	49,689	42,603	-7,086	-14.3%
Advanced Scientific Computing Research	9,422	10,127	4,544	-5,583	-55.1%
Biological and Environmental Research	7,384	6,732	4,530	-2,202	-32.7%
Fusion Energy Sciences	3,367	3,735	3,516	-219	-5.9%
Total, Sandia Site Office	68,058	70,283	55,193	-15,090	-21.5%

(dollars in thousands)	FY 2004	FY 2005	FY 2006	$ Change	% Change
Savannah River Site					
Westinghouse - Savannah River					
Biological and Environmental Research	823	773	654	-119	-15.4%
Fusion Energy Sciences	45	37	40	+3	+8.1%
Total, Westinghouse – Savannah River	868	810	694	-116	-14.3%
Savannah River Operations Office					
Biological and Environmental Research	7,599	7,748	0	-7,748	-100.0%
Total, Savannah River Site	8,467	8,558	694	-7,864	-91.9%
Stanford Site Office					
Stanford Linear Accelerator Center					
Basic Energy Sciences	45,076	91,378	152,609	+61,231	+67.0%
Advanced Scientific Computing Research	1,554	485	300	-185	-38.1%
Biological and Environmental Research	3,958	3,450	4,350	+900	+26.1%
High Energy Physics	166,426	166,192	143,951	-22,241	-13.4%
Science Laboratories Infrastructure	2,746	2,775	5,443	+2,668	+96.1%
Workforce Development for Teachers and Scientists	150	150	130	-20	-13.3%
Safeguards and Security	2,214	2,341	2,511	+170	+7.3%
Total, Stanford Linear Accelerator Center	222,124	266,771	309,294	+42,523	+15.9%
Stanford Site Office					
Science Program Direction	1,045	1,655	1,709	+54	+3.3%
Total, Stanford Site Office	223,169	268,426	311,003	+42,577	+15.9%
Thomas Jefferson Site Office					
Thomas Jefferson National Accelerator Facility					
Advanced Scientific Computing Research	300	0	0	0	0.0%
Biological and Environmental Research	891	525	400	-125	-23.8%
High Energy Physics	110	0	0	0	0.0%
Nuclear Physics	83,292	85,946	78,988	-6,958	-8.1%
Science Laboratories Infrastructure	9,357	0	0	0	0.0%
Workforce Development for Teachers and Scientists	289	136	250	+114	+83.8%
Safeguards and Security	972	1,474	1,224	-250	-17.0%
Total, Thomas Jefferson National Accelerator Facility	95,211	88,081	80,862	-7,219	-8.2%
Thomas Jefferson Site Office					
Science Program Direction	1,030	1,407	1,457	+50	+3.6%
Total, Thomas Jefferson Site Office	96,241	89,488	82,319	-7,169	-8.0%

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Washington Headquarters					
Basic Energy Sciences	2,056	128,051	79,923	-48,128	-37.6%
Advanced Scientific Computing Research	1,082	24,819	62,905	+38,086	+153.5%
Biological and Environmental Research	716	151,739	91,716	-60,023	-39.6%
High Energy Physics	24,182	65,782	73,194	+7,412	+11.3%
Nuclear Physics	1,275	24,630	20,954	-3,676	-14.9%
Fusion Energy Sciences	584	14,271	12,885	-1,386	-9.7%
Science Laboratories Infrastructure	454	5,614	3,000	-2,614	-46.6%
Science Program Direction	66,258	64,897	70,132	+5,235	+8.1%
Workforce Development for Teachers and Scientists	0	2,967	158	-2,809	-94.7%
Safeguards and Security	315	344	380	+36	+10.5%
Total, Washington Headquarters	96,922	483,114	415,247	-67,867	-14.0%
Total, Science	3,553,144	3,610,213	3,468,323	-141,890	-3.9%

Site Description

Ames Site Office

Introduction

The Ames Site Office provides the single federal presence with responsibility for contract performance at the Ames Laboratory. This site office provides an on-site Office of Science (SC) presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Ames Laboratory

Introduction

The Ames Laboratory is a program dedicated laboratory (Basic Energy Sciences). The laboratory is located on the campus of the Iowa State University, in Ames, Iowa, and consists of 10 buildings (324,500 gross square feet of space) with the average age of the buildings being 40 years. DOE does not own the land. Ames conducts fundamental research in the physical, chemical, and mathematical sciences associated with energy generation and storage and is a national center for the synthesis, analysis, and engineering of rare-earth metals and their compounds.

Basic Energy Sciences

Ames supports experimental and theoretical research on rare earth elements in novel mechanical, magnetic, and superconducting materials. Ames scientists are experts on magnets, superconductors, and quasicrystals that incorporate rare earth elements. Ames also supports theoretical studies for the prediction of molecular energetics and chemical reaction rates and provides leadership in analytical and separations chemistry.

Ames is home to the **Materials Preparation Center (MPC)**, which is dedicated to the preparation, purification, and characterization of rare-earth, alkaline-earth, and refractory metal and oxide materials. Established in 1981, the MPC is a one-of-a-kind resource that provides scientists at university, industrial, and government laboratories with research and developmental quantities of high purity materials and unique analytical and characterization services that are not available from commercial suppliers. The MPC is renowned for its technical expertise in alloy design and for creating materials that exhibit ultrafine microstructures, high strength, magnetism, and high conductivity.

Advanced Scientific Computing Research

Ames conducts research in computer science and participates on one of the Scientific Discovery through Advanced Computing (SciDAC) teams. Ames also participates in Integrated Software Infrastructure Center activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

Ames conducts research into new biological imaging techniques such as the study of gene expression in real time and fluorescence spectroscopy to study environmental carcinogens.

Science Laboratories Infrastructure

The Science Laboratories Infrastructure (SLI) program enables Departmental research missions at the laboratory by funding line item construction and general plants projects (GPP) to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with Occupational Safety and Health Administration (OSHA) requirements.

Safeguards and Security

This program coordinates planning, policy, implementation, and oversight in the areas of security systems, protective forces, personnel security, material control and accountability, and cyber security. A protective force is maintained to provide protection of personnel, equipment, and property from acts of theft, vandalism, and sabotage through facility walk-through, monitoring of electronic alarm systems, and emergency communications.

Argonne Site Office

Introduction

The Argonne Site Office provides the single federal presence with responsibility for contract performance at the Argonne National Laboratory (ANL). This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Argonne National Laboratory

Introduction

The Argonne National Laboratory in Argonne, Illinois, is a multiprogram laboratory located on 1,700 acres in suburban Chicago. The laboratory consists of 99 buildings (4.5 million gross square feet of space) with an average building age of 33 years.

Basic Energy Sciences

ANL is home to research activities in broad areas of materials and chemical sciences. It is also the site of three user facilities—the Advanced Photon Source (APS), the Intense Pulsed Neutron Source (IPNS), and the Electron Microscopy Center for Materials Research (EMC).

The **Advanced Photon Source** is one of only three third-generation, hard x-ray synchrotron radiation light sources in the world. The 1,104-meter circumference facility—large enough to house a baseball park in its center—includes 34 bending magnets and 34 insertion devices, which generate a capacity of 68 beamlines for experimental research. Instruments on these beamlines attract researchers to study the structure and properties of materials in a variety of disciplines, including condensed matter physics, materials sciences, chemistry, geosciences, structural biology, medical imaging, and environmental sciences. The high-quality, reliable x-ray beams at the APS have already brought about new discoveries in materials structure.

The **Intense Pulsed Neutron Source** is a short-pulsed spallation neutron source that first operated all of its instruments in the user mode in 1981. Twelve neutron beam lines serve 14 instruments. Distinguishing characteristics of IPNS include its innovative instrumentation and source technology and its dedication to serving the users. The first generation of virtually every pulsed source neutron scattering instrument was developed at IPNS. In addition, the source and moderator technologies developed at IPNS, including uranium targets, liquid hydrogen and methane moderators, solid methane moderators, and decoupled reflectors, have impacted spallation sources worldwide. Research at IPNS is conducted on the structure of high-temperature superconductors, alloys, composites, polymers, catalysts, liquids and non-crystalline materials, materials for advanced energy technologies, and biological materials.

The **Electron Microscopy Center for Materials Research** provides *in-situ*, high-voltage and intermediate voltage, high-spatial resolution electron microscope capabilities for direct observation of ion-solid interactions during irradiation of samples with high-energy ion beams. The EMC employs both a tandem accelerator and an ion implanter in conjunction with a transmission electron microscope for simultaneous ion irradiation and electron beam microcharacterization. It is the only instrumentation of its type in the western hemisphere. The unique combination of two ion accelerators and an electron microscope permits direct, real-time, *in-situ* observation of the effects of ion bombardment of materials and consequently attracts users from around the world. Research at EMC includes microscopy based studies on high-temperature superconducting materials, irradiation effects in metals and semiconductors, phase transformations, and processing related structure and chemistry of interfaces in thin films.

Advanced Scientific Computing Research

ANL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools and collaboratory tools. ANL also participates in several scientific applications and participates on a number of the SciDAC teams. Further, it focuses on testing and evaluating leading edge research computers and participates in Integrated Software Infrastructure Center (ISIC) activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

ANL operates a high-throughput national user facility for protein crystallography at APS that also supports a growing environmental science community. In support of climate change research, it coordinates the operation and development of the Southern Great Plains, Tropical Western Pacific, and North Slope of Alaska Atmospheric Radiation Measurement (ARM) sites. ANL also conducts research to develop and apply software to enable efficient long-term climate simulations on distributed-memory multiprocessor computing platforms. Research is conducted to understand the molecular control of genes and gene pathways in microbes. In conjunction with the Oak Ridge National Laboratory (ORNL) and the Pacific Northwest National Laboratory (PNNL) and six universities, ANL is a participating lab in the Carbon Sequestration in Terrestrial Ecosystems (CSiTE) consortium, focusing on research to understand the processes controlling the rate of soil carbon accretion. APS supports environmental remediation sciences researchers and ANL conducts environmental remediation sciences research

High Energy Physics

The High Energy Physics (HEP) program supports physics research and technology R&D at ANL, using unique capabilities of the laboratory in the areas of engineering and detector technology and advanced accelerator and computing techniques.

Nuclear Physics

The major ANL activity is the operation and research and development program at the Argonne Tandem Linac Accelerator System (ATLAS) national user facility. Other activities include an on-site program of research using laser techniques (Atom Trap Trace Analysis); programs at Thomas Jefferson National Accelerator Facility (TJNAF), Fermi National Laboratory (Fermilab), Relativistic Heavy Ion Collider (RHIC) and DESY in Germany investigating the structure of the nucleon; R&D directed towards the proposed Rare Isotope Accelerator (RIA) facility; theoretical calculations and investigations in subjects supporting the experimental research programs in Medium Energy and Low Energy physics; and data compilation and evaluation activities as part of the National Nuclear Data Program.

The **Argonne Tandem Linac Accelerator System** facility provides variable energy, precision beams of stable ions from protons through uranium, at energies near the Coulomb barrier (up to 10 MeV per nucleon) using a superconducting linear accelerator. Most work is performed with stable heavy-ion beams; however, about 10% of the beams are exotic (radioactive) beams. The ATLAS facility features a wide array of experimental instrumentation, including a world-leading ion-trap apparatus, the Advanced Penning Trap. The Gammasphere detector, coupled with the Fragment Mass Analyzer, is a unique world facility for measurement of nuclei at the limits of angular momentum (high-spin states). ATLAS staff are world leaders in superconducting linear accelerator technology, with particular application to the proposed RIA facility. The combination of versatile beams and powerful instruments enables ~230 users annually at ATLAS to conduct research in a broad program in nuclear structure and dynamics, nuclear astrophysics, and fundamental interaction studies.

Fusion Energy Sciences

Argonne contributes to the plasma facing components area of the enabling R&D program activities, focusing on modeling of plasma-materials interaction phenomena of interest for ITER and current plasma experiments.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements. The SLI program also provides Payments in Lieu of Taxes (PILT) to local communities around the laboratory.

Safeguards and Security

This program provides protection of nuclear materials, classified matter, government property, and other vital assets from unauthorized access, theft, diversion, sabotage, espionage, and other hostile acts that may cause risks to national security, the health and safety of DOE and contractor employees, the public, or the environment. Program activities include security systems, material control and accountability, information and cyber security, and personnel security. In addition, a protective force is maintained. These activities ensure that the facility, personnel, and assets remain safe from potential threats.

Berkeley Site Office

Introduction

The Berkeley Site Office provides the single federal presence with responsibility for contract performance at the Lawrence Berkeley National Laboratory (LBNL). This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Lawrence Berkeley National Laboratory

Introduction

The Lawrence Berkeley National Laboratory is a multiprogram laboratory located in Berkeley, California, on a 200-acre site adjacent to the Berkeley campus of the University of California. The laboratory consists of 106 buildings (1.6 million gross square feet of space) with an average building age of 35 years. LBNL is dedicated to performing leading-edge research in the biological, physical, materials, chemical, energy, and computer sciences. The land is leased from the University of California.

Basic Energy Sciences

LBNL is home to major research efforts in materials and chemical sciences as well as to efforts in geosciences, engineering, and biosciences. Collocated with the University of California at Berkeley, the Laboratory benefits from regular collaborations and joint appointments with numerous outstanding faculty members. The Laboratory is the home to the research of many students and postdoctoral appointees. It is also the site of two Basic Energy Sciences (BES) supported user facilities — the Advanced Light Source (ALS) and the National Center for Electron Microscopy (NCEM).

The **Advanced Light Source** provides vacuum-ultraviolet light and x-rays for probing the electronic and magnetic structure of atoms, molecules, and solids, such as those for high-temperature superconductors. The high brightness and coherence of the ALS light are particularly suited for soft x-ray imaging of biological structures, environmental samples, polymers, magnetic nanostructures, and other inhomogeneous materials. Other uses of the ALS include holography, interferometry, and the study of molecules adsorbed on solid surfaces. The pulsed nature of the ALS light offers special opportunities for time resolved research, such as the dynamics of chemical reactions. Shorter wavelength x-rays are also used at structural biology experimental stations for x-ray crystallography and x-ray spectroscopy of proteins and other important biological macromolecules. The ALS is a growing facility with a lengthening portfolio of beamlines that has already been applied to make important discoveries in a wide variety of scientific disciplines.

The **National Center for Electron Microscopy** provides instrumentation for high-resolution, electron-optical microcharacterization of atomic structure and composition of metals, ceramics, semiconductors, superconductors, and magnetic materials. This facility contains one of the highest resolution electron microscopes in the U.S.

Advanced Scientific Computing Research

LBNL conducts basic research in the mathematics and computer science, as well as research in advanced computing software tools and network research. It participates in several scientific application partnerships, including the partnership with the BES program in nanoscale science, and participates on a number of the SciDAC teams. LBNL manages the Energy Sciences Network (ESnet). ESnet is one of the worlds most effective and progressive science-related computer networks that provides worldwide access and communications to Department of Energy facilities. LBNL is also the site of the National Energy Research Scientific Computing Center (NERSC), which provides a range of high-performance, state-of-the-art computing resources that are a critical element in the success of many SC research programs. LBNL participates in ISIC activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

LBNL is one of the major national laboratory partners forming the Joint Genome Institute (JGI) whose principal goals are high-throughput DNA sequencing techniques and studies on the biological functions associated with the newly sequenced human DNA. The laboratory also conducts research on the molecular mechanisms of cell responses to low doses of radiation, on the use of model organisms to understand and characterize the human genome, and on microbial systems biology research as part of Genomics:GTL. LBNL operates beam lines for determination of protein structure at the ALS for use by the national and international biological research community. The ALS is also used by a growing environmental science community. The nuclear medicine program supports research into novel radiopharmaceuticals for medical diagnosis and therapy and studies of novel instrumentation for imaging of living systems for medical diagnosis. LBNL also supports the environmental remediation sciences research and the geophysical and biophysical research capabilities for field sites in that program.

LBNL conducts research into new technologies for the detailed characterization of complex environmental contamination. It also develops scalable implementation technologies that allow widely used climate models to run effectively and efficiently on massively parallel processing supercomputers. LBNL also conducts research on terrestrial carbon cycling to understand the processes controlling the exchange of CO_2 between terrestrial ecosystems and the atmosphere.

High Energy Physics

The HEP program supports physics research and technology R&D at LBNL, using unique capabilities of the laboratory in the areas of superconducting magnet R&D, engineering and detector technology, world-forefront expertise in laser driven particle acceleration, expertise in design of advanced electronic devices, computational resources, and design of modern, complex software codes for HEP experiments.

Nuclear Physics

The Low Energy subprogram has supported operations and the research program of the 88-Inch Cyclotron, whose operations transitioned in FY 2004 to a dedicated in-house facility with partial operational support from other federal agencies to carry out their programs. Other activities include fabrication of a next-generation gamma-ray detector system, GRETINA; research with the STAR detector located at Brookhaven’s RHIC facility, operation of the Parallel Distributed Systems Facility aimed at heavy-ion and low energy physics computation, and a smaller research and development activity directed towards the ALICE detector within the heavy-ion program at the Large Hadron Collider at CERN; operation of the Sudbury Neutrino Observatory (SNO) detector in Canada and the KamLAND detector in Japan that are performing neutrino studies; development of next generation neutrino detectors; a program with emphasis on the theory of relativistic heavy-ion physics; data compilation and evaluation activities supporting the National Nuclear Data Center at BNL; and a technical effort in RIA R&D with the development of electron-cyclotron resonance (ECR) ion sources.

Fusion Energy Sciences

LBNL has been conducting research into the physics of generating, injecting, transporting, and focusing of high-brightness heavy ion beams for applications to inertial fusion energy in the long term. It has developed three substantial experimental systems for doing this research: the Neutralized Transport Experiment, the High Current Experiment, and the Ion Source Test Stand. The program is currently being redirected to focus on developing ion beams and beam-target interaction physics for applications to high energy density physics in the near term (5 to 10 years). LBNL conducts this research together with the Lawrence Livermore National Laboratory and Princeton Plasma Physics Laboratory (PPPL) through the Heavy-Ion Fusion Virtual National Laboratory.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

This program provides physical protection of personnel and laboratory facilities. This is accomplished with protective forces, security systems, cyber security, personnel security, and material control and accountability of special nuclear material.

Brookhaven Site Office

Introduction

The Brookhaven Site Office provides the single federal presence with responsibility for contract performance at the Brookhaven National Laboratory (BNL). This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Brookhaven National Laboratory

Introduction

The Brookhaven National Laboratory is a multiprogram laboratory located on 5,300 acres in Upton, New York. The laboratory consists of 345 buildings (3.9 million gross square feet of space) with an average building age of 35 years. BNL creates and operates major facilities available to university, industrial, and government personnel for basic and applied research in the physical, biomedical, and environmental sciences, and in selected energy technologies.

Basic Energy Sciences

BNL conducts major research efforts in materials and chemical sciences as well as to efforts in geosciences and biosciences. It is also the site of the National Synchrotron Light Source (NSLS).

The **National Synchrotron Light Source** (NSLS) is among the largest and most diverse scientific user facilities in the world. The NSLS, commissioned in 1982, has consistently operated at >95% reliability 24 hours a day, 7 days a week, with scheduled periods for maintenance and machine studies. Adding to its breadth is the fact that the NSLS consists of two distinct electron storage rings. The x-ray storage ring is 170 meters in circumference and can accommodate 60 beamlines or experimental stations, and the vacuum-ultraviolet (VUV) storage ring can provide 25 additional beamlines around its circumference of 51 meters. Synchrotron light from the x-ray ring is used to determine the atomic structure of materials using diffraction, absorption, and imaging techniques. Experiments at the VUV ring help solve the atomic and electronic structure as well as the magnetic properties of a wide array of materials. These data are fundamentally important to virtually all of the physical and life sciences as well as providing immensely useful information for practical applications. The petroleum industry, for example, uses the NSLS to develop new catalysts for refining crude oil and making by-products like plastics.

Advanced Scientific Computing Research

BNL conducts basic research in applied mathematics and participates on one of the SciDAC teams. It also participates in ISIC activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

BNL operates beam lines for protein crystallography at the NSLS for use by the national biological research community, research in biological structure determination, and research into new instrumentation for detecting x-rays and neutrons. Research is also conducted on the molecular mechanisms of cell responses to low doses of radiation.

Climate change research includes the operation of the ARM External Data resource that provides ARM investigators with data from non-ARM sources, including satellite and ground-based systems. BNL scientists form an important part of the science team in the Atmospheric Sciences program, including providing special expertise in atmospheric field campaigns and aerosol research to the program's chief scientist. BNL scientists play a leadership role in the operation of the Free-Air Carbon Dioxide Enrichment (FACE) facility at the Duke Forest used to understand how plants respond to elevated carbon dioxide concentrations in the atmosphere.

BNL is participating in the NSF/DOE Environmental Molecular Sciences Institute at State University of New York-Stony Brook and has instituted a new internal initiative EnviroSuite to support a growing community of environmental users at NSLS.

High Energy Physics

The HEP program supports physics research and technology R&D at BNL, using unique resources of the laboratory, including engineering and detector technology, superconducting magnet R&D, computational resources, and the Accelerator Test Facility.

Nuclear Physics

Research activities include use of relativistic heavy-ion beams and polarized protons in the Relativistic Heavy Ion Collider (RHIC) to investigate hot, dense nuclear matter and to understand the internal "spin" structure of the proton, respectively; use of polarized photon beams by the Laser Electron Gamma Source (LEGS) group to carry out a program of photonuclear spin physics at the NSLS; research on the properties of neutrinos at the Sudbury Neutrino Observatory (SNO); and data compilation and evaluation at the National Nuclear Data Center (NNDC) that is the central U.S. site for these national and international efforts.

The **Relativistic Heavy Ion Collider** Facility, completed in 1999, is a major unique international facility currently used by about 1,000 scientists from 19 countries. RHIC uses the Tandem Van de Graaff, Booster Synchrotron, and Alternating Gradient Synchrotron (AGS) accelerators in combination to inject beams into two rings of superconducting magnets of almost 4 kilometers circumference with 6 intersection regions where the beams can collide. It can accelerate and collide a variety of heavy ions, including gold beams, up to an energy of 100 GeV per nucleon. RHIC is being used to search for the predicted "quark-gluon plasma," a form of nuclear matter thought to have existed microseconds after the "Big Bang." It can also collide polarized protons with beams of energy up to 250 GeV per nucleon: a unique capability. Four detectors have been fabricated to provide complementary measurements, with some overlap in order to cross-calibrate the measurements. (1) The core of the Solenoidal Tracker at RHIC (STAR) detector is a large Time Projection Chamber (TPC) located inside a solenoidal magnet that tracks thousands of charged particles emanating from a single head-on gold-gold collision. A large modular barrel Electro-Magnetic Calorimeter (EMCal) and end-cap calorimeter measure deposited energy for high-energy charged and neutral particles and contain particle-photon discrimination capability. Other ancillary detector systems include a Silicon Vertex Tracker and forward particle tracking capabilities. (2) The Pioneering High-Energy Nuclear Interacting eXperiment (PHENIX) detector has a particular focus on the measurement of rare probes at high event detection rate. It consists of two transverse spectrometer arms that can track charged particles within a magnetic field, especially to higher momentum: it provides excellent discrimination among photons, electrons, and hadrons. There are also two large muon tracking and identification systems in the forward and backward directions as well as ancillary tracker systems. (3) The Phobos detector is a very compact detector that uses mostly silicon pad sensors for charged particle detection and tracking, with a focus on measurements to very low momentum. (4) The Broad RAnge Hadron Magnetic Spectrometer (BRAHMS) has two small acceptance magnetic spectrometer arms that can be rotated to scan the broadest range of angles, designed to study the charged-particle distributions especially in the forward direction. International participation has been essential in the implantation of all these detector systems.

The **Alternating Gradient Synchrotron** provides high intensity pulsed proton beams up to 33 GeV on fixed targets and secondary beams of kaons, muons, pions, and anti-protons. The AGS is the injector of (polarized) proton and heavy-ion beams into RHIC, and its operations are supported by the Heavy Ion subprogram as part of the RHIC facility. Operation of the AGS for fixed target experiments is planned through the recently approved Rare Symmetry Violating Processes (RSVP) program being supported by the National Science Foundation (NSF). The AGS is also utilized for radiation damage studies of electronic systems for NASA supported work, among a variety of uses, with the support for these activities being provided by the relevant agencies.

The **Booster Synchrotron**, part of the RHIC injector, is providing heavy-ion beams to a dedicated beam line (NASA Space Radiation Laboratory) for biological and electronic systems radiation studies funded by NASA. The incremental costs for these studies are provided by NASA.

The **National Nuclear Data Center (NNDC)** is the central U.S. site for national and international nuclear data and compilation efforts. The U.S. Nuclear Data program is the United States' repository for information generated in low- and intermediate-energy nuclear physics research worldwide. This information consists of both bibliographic and numeric data. The NNDC is a resource for a very broad user community in all aspects of nuclear technology, with relevance to homeland security. Nuclear Data program-funded scientists at U.S. national laboratories and universities contribute to the activities and responsibilities of the NNDC.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements. The SLI program also provides PILT to local communities around the laboratory.

Safeguards and Security

The Safeguards and Security (S&S) program activities are focused on protective forces, cyber security, physical security, and material control and accountability. BNL operates a transportation division to move special nuclear materials around the site. Material control and accountability efforts focus on accurately accounting for and protecting the site's special nuclear materials.

Chicago Office

Introduction

The Chicago Office supports the Department's programmatic missions in Science and Technology, National Nuclear Security, Energy Resources, and Environmental Quality by providing expertise and assistance in such areas as contract management, procurement, project management, engineering, facilities and infrastructure, property management, construction, human resources, financial management, general and patent law, environmental protection, quality assurance, integrated safety management, integrated safeguards and security management, nuclear material control and accountability, and emergency management. Chicago directly supports site offices responsible for program management oversight of seven major management and operating laboratories— Ames Laboratory, Argonne National Laboratory, Lawrence Berkeley National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Princeton Plasma Physics Laboratory, and Stanford Linear Accelerator Center—and one government-owned and government-operated Federal laboratory, New Brunswick Laboratory. Additionally, the administrative, business and technical expertise of Chicago is shared SC-wide through the Integrated Support Center concept. Chicago serves as SC's grant center, administering grants to 272 colleges/universities in all 50 states, Washington, D.C., and Puerto Rico, as determined by the DOE-SC program offices as well as non-SC offices.

Basic Energy Sciences

The BES program funds research at 168 colleges/universities located in 48 states.

Advanced Scientific Computing Research

The Advanced Scientific Computing Research (ASCR) program funds research at 71 colleges/universities located in 24 states supporting approximately 126 principal investigators.

Biological and Environmental Research

The Biological and Environmental Research (BER) program funds research at some 220 institutions, including colleges/universities, private industry, and other federal and private research institutions located in 44 states.

High Energy Physics

The HEP program supports about 260 research groups at more than 100 colleges and universities located in 36 states, Washington, D.C., and Puerto Rico. The strength and effectiveness of the university-based program is critically important to the success of the program as a whole.

Nuclear Physics

The Nuclear Physics (NP) program funds 185 research grants at 85 colleges/universities located in 35 states. Among these are grants with the Triangle Universities Nuclear Laboratory (TUNL); Texas A&M (TAMU) Cyclotron; the Yale Tandem Van de Graaff; the University of Washington Tandem Van de Graaff; and a cooperative agreement with the Massachusetts Institute of Technology (MIT). These accelerator facilities offer niche capabilities and opportunities not available at the national user facilities, or many foreign low-energy laboratories, such as specialized sources and targets, opportunities for extended experiments, and specialized instrumentation. Also supported is the Institute for Nuclear Theory (INT) at the University of Washington, a premier international center for new initiatives and collaborations in nuclear theory research.

Fusion Energy Sciences

The Fusion Energy Sciences (FES) program funds research at more than 50 colleges and universities located in approximately 30 states. FES also funds the DIII-D tokamak experiment and related programs at GA, an industrial firm located in San Diego, California.

Fermi Site Office

Introduction

The Fermi Site Office provides the single federal presence with responsibility for contract performance at the Fermi National Accelerator Laboratory. This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Fermi National Accelerator Laboratory

Introduction

Fermi National Accelerator Laboratory (Fermilab) is a program-dedicated laboratory (High Energy Physics) located on a 6,800-acre site in Batavia, Illinois. The laboratory consists of 348 buildings (2.3 million gross square feet of space) with an average building age of 38 years. Fermilab is the largest U.S. laboratory for research in high-energy physics and is second only to CERN, the European Laboratory for Particle Physics. About 2,500 scientific users, scientists from universities and laboratories throughout the U.S. and around the world, use Fermilab for their research. Fermilab's mission is the goal of high-energy physics: to understand matter at its deepest level, to identify its fundamental building blocks, and to understand how the laws of nature determine their interactions.

Advanced Scientific Computing Research

Fermilab conducts research in the network environment for science.

High Energy Physics

Fermilab operates the Tevatron accelerator and colliding beam facility, which consists of a four-mile ring of superconducting magnets and two large multi-purpose detectors, and is capable of accelerating protons and antiprotons to an energy of one trillion electron volts (1 TeV). The Tevatron is the highest energy proton accelerator in the world, and will remain so until the Large Hadron Collider begins commissioning at the European Organization for Nuclear Research (CERN) in 2007. With the shutdown of the Large Electron-Positron (LEP) collider at CERN in 2000, the Tevatron became the only operating particle accelerator at the energy frontier. The Tevatron complex also includes the Booster and the Main Injector, pre-accelerators to the Tevatron. The Main Injector, which is used for the pre-acceleration of protons and production of antiprotons as a part of the Tevatron complex, will also be used independently of the Tevatron for a 120 GeV fixed target program, including the Neutrinos at the Main Injector (NuMI) beamline which starts operation in 2005. The Booster is used to accelerate low-energy protons, and a small part of the beam that is not used for Tevatron collider operations is provided to produce neutrinos for short-baseline oscillation experiments. Fermilab is the principal experimental facility for HEP. The HEP program also supports physics research and technology R&D at Fermilab, using unique resources of the laboratory, including engineering and detector technology, superconducting magnet R&D, and computational resources.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

S&S program efforts are directed at maintaining protective force staffing and operations to protect personnel and the facility, and toward continuing the cyber security, security systems, and material control and accountability programs to accurately account for and protect the facility's special nuclear materials. Limited funding increases would be applied to security systems and the Foreign Visits and Assignments program.

Idaho Operations Office

Idaho National Laboratory

Introduction

Idaho National Laboratory (INL) is a multiprogram laboratory located on 572,000 acres in Idaho Falls, Idaho. Within the laboratory complex are nine major applied engineering, interim storage and research and development facilities.

Basic Energy Sciences

INL supports studies to understand and improve the life expectancy of material systems used in engineering.

Biological and Environmental Research

Using unique DOE capabilities such as advanced software for controlling neutron beams and calculating dose, INL supports research into boron chemistry, radiation dosimetry, analytical chemistry of boron in tissues, and engineering of new computational systems for application of radiation treatment to tumors, including brain tumors. BER support for Boron Neutron Capture Therapy dosimetry and support programs at INL and the core programs to determine boronconcentrations in biologic specimens will terminate in FY 2005. INL is also conducting research in subsurface science relating to clean up of the nuclear weapons complex.

Fusion Energy Sciences

Since 1978, INL has been the lead laboratory for fusion safety. As such, it has helped to develop the fusion safety database that will demonstrate the environmental and safety characteristics of both nearer term fusion devices and future fusion power plants. Research at INL focuses on the safety aspects of magnetic fusion concepts for existing and future machines, such as a burning plasma experiment, and further developing our domestic safety database using existing collaborative arrangements to conduct work on international facilities. In addition, INL has expanded their research and facilities capabilities to include tritium science activities. INL has completed fabrication of the Safety and Tritium Applied Research (STAR) Facility, which is a small tritium laboratory where the fusion program can conduct tritium material science, chemistry, and safety experiments. The STAR Facility has been declared a National User Facility. INL also coordinates codes and standards within the ITER program.

Livermore Site Office

Lawrence Livermore National Laboratory

Introduction

Lawrence Livermore National Laboratory (LLNL) is a multiprogram laboratory located on 821 acres in Livermore, California. This laboratory was built in Livermore as a weapons laboratory 42 miles from the campus of the University of California at Berkeley to take advantage of the expertise of the university in the physical sciences.

Basic Energy Sciences

LLNL supports research in materials sciences and in geosciences research on the sources of electromagnetic responses in crustal rocks, seismology theory and modeling, the mechanisms and kinetics of low-temperature geochemical processes and the relationships among reactive fluid flow, geochemical transport, and fracture permeability.

Advanced Scientific Computing Research

LLNL participates in base applied mathematics and computer science research and SciDAC efforts. It also participates in ISIC activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

LLNL is one of the major national laboratory partners that comprise the Joint Genome Institute (JGI) whose principal goals are high-throughput DNA sequencing and studies on the biological functions associated with newly sequenced human DNA. LLNL is developing new biocompatible materials and microelectronics for the artificial retina project. It also conducts research on the molecular mechanisms of cell responses to low doses of radiation, and on the use of model organisms to understand and characterize the human genome.

Through the program for Climate Model Diagnosis and Intercomparison, LLNL provides the international leadership to develop and apply diagnostic tools to evaluate the performance of climate models and to improve them. Virtually every climate modeling center in the world participates in this unique program. It also conducts research to improve understanding of the climate system, particularly the climate effect of clouds and related processes.

High Energy Physics

The HEP program supports physics research and technology R&D at LLNL, using unique capabilities of the laboratory primarily in the area of engineering and detector technology and advanced accelerator R&D.

Nuclear Physics

The LLNL program supports research in experimental and theoretical nuclear structure studies, for relativistic heavy-ion experiments as part of the PHENIX collaboration, for nuclear data and compilation activities, and for a technical effort involved in RIA R&D.

Fusion Energy Sciences

LLNL works with LBNL and PPPL through the Heavy-Ion Fusion Virtual National Laboratory in advancing the physics of heavy ion beams as a driver for inertial fusion energy in the long term and high energy density physics in the near term. It also conducts research in the concept of Fast Ignition for applications in high energy density physics and inertial fusion energy. The LLNL program also includes collaborations with General Atomics on the DIII-D tokamak, operation of an innovative concept experiment, the Sustained Spheromak Physics Experiment at LLNL, and benchmarking of fusion physics computer models with experiments such as DIII-D. It carries out research in the simulation of turbulence and its effect on transport of heat and particles in magnetically confined plasmas.

Science Laboratories Infrastructure

The SLI program enables the cleanup and removal of excess SC facilities at LLNL.

Los Alamos Site Office

Los Alamos National Laboratory

Introduction

Los Alamos National Laboratory (LANL) is a multiprogram laboratory located on 27,000 acres in Los Alamos, New Mexico.

Basic Energy Sciences

LANL is home to selected research efforts in materials sciences, chemical sciences, geosciences, and engineering. LANL supports research on strongly correlated electronic materials, high-magnetic fields, microstructures, deformation, alloys, bulk ferromagnetic glasses, mechanical properties, ion enhanced synthesis of materials, metastable phases and microstructures, and mixtures of particles in liquids.

Research is also supported to understand the electronic structure and reactivity of actinides through the study of organometallic compounds. Also supported is work to understand the chemistry of plutonium and other light actinides in both near-neutral pH conditions and under strongly alkaline conditions relevant to radioactive wastes and research in physical electrochemistry fundamental to energy storage systems. In the areas of geosciences, experimental and theoretical research is supported on rock physics, seismic imaging, the physics of the earth's magnetic field, fundamental geochemical studies of isotopic equilibrium/disequilibrium, and mineral-fluid-microbial interactions.

The **Manuel Lujan Jr. Neutron Scattering Center** (Lujan Center) provides an intense pulsed source of neutrons to a variety of spectrometers for neutron scattering studies. The Lujan Center features instruments for measurement of high-pressure and high-temperature samples, strain measurement, liquid studies, and texture measurement. The facility has a long history and extensive experience in handling actinide samples. A 30 Tesla magnet is also available for use with neutron scattering to study samples in high-magnetic fields. The Lujan Center is part of the Los Alamos Neutron Science Center (LANSCE), which is comprised of a high-power 800-MeV proton linear accelerator, a proton storage ring, production targets to the Lujan Center and the Weapons Neutron Research facility, and a variety of associated experiment areas and spectrometers for national security research and civilian research.

Advanced Scientific Computing Research

LANL conducts basic research in the mathematics and computer science and in advanced computing software tools. It also participates in several scientific application and collaboratory pilot projects and participates on a number of the SciDAC teams. LANL participates in ISIC activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

LANL is one of the major national laboratory partners that comprise the JGI whose principal goals are high-throughput DNA sequencing and studies on the biological functions associated with newly sequenced human DNA. One of LANL's roles in the JGI involves the production of high quality "finished" DNA sequence. It also conducts research on the molecular mechanisms of cell responses to low doses of radiation and on research to understand the molecular control of genes and gene pathways in microbes. Activities in structural biology include the operation of an experimental station for protein crystallography at the LANSCE for use by the national biological research community.

LANL provides the site manager for the Tropical Western Pacific ARM site. LANL also has a crucial role in the development, optimization, and validation of coupled atmospheric and oceanic general circulation models using massively parallel computers. LANL also conducts research into advanced medical imaging technologies for studying brain function including optical imaging and magnetoencepholography, novel radionuclide dosimetry and therapy, and research into new techniques for rapid characterization and sorting of mixtures of cells and cell fragments. LANL also conducts research under environmental remediation sciences.

High Energy Physics

The HEP program supports physics research and technology R&D at LANL, using unique capabilities of the laboratory primarily in the area of theoretical studies, engineering, and detector technology.

Nuclear Physics

NP supports a broad program of research including: a program of neutron beam research that utilizes beams from LANSCE facility to make fundamental physics measurements; the development of an experiment to search for the electric dipole moment of the neutron; a research and development effort in relativistic heavy-ions using the PHENIX detector at the RHIC and development of next generation instrumentation for RHIC; research directed at the study of the quark substructure of the nucleon in experiments at Fermilab, and the "spin" structure of nucleons at RHIC using polarized proton beams; research at the Sudbury Neutrino Observatory (SNO) and at MiniBooNE directed at studies of the properties of neutrinos including development of the next generation detector; a broad program of theoretical research; nuclear data and compilation activities as part of the national nuclear data program; and a technical effort involved in RIA R&D.

Fusion Energy Sciences

LANL supports the creation of computer codes for modeling the stability of magnetically confined plasmas, including tokamaks and innovative confinement concepts. The work provides also theoretical and computational support for the Madison Symmetric Torus experiment, a proof-of-principle experiment in reversed field pinch at the University of Wisconsin in Madison. LANL develops advanced diagnostics for the National Spherical Torus Experiment (NSTX) at PPPL and other fusion experiments such as the Rotating Magnetic Field as a current drive mechanism for the Field Reversed Configuration Experiment at the University of Washington in Seattle, Washington. LANL is also investigating innovative confinement concepts such as Magnetized Target Fusion and Inertial Electrostatic Confinement. LANL also supports the tritium processing activities needed for ITER.

NNSA Service Center/Albuquerque

National Renewable Energy Laboratory

Introduction

The National Renewable Energy Laboratory (NREL) is a program-dedicated laboratory (Solar) located on 300 acres in Golden, Colorado. NREL was built to emphasize renewable energy technologies such as photovoltaics and other means of exploiting solar energy. It is the world leader in renewable energy technology development. Since its inception in 1977, NREL's sole mission has been to develop renewable energy and energy efficiency technologies and transfer these technologies to the private sector.

Basic Energy Sciences

NREL supports basic research efforts that underpin this technological emphasis at the laboratory; e.g., on overcoming semiconductor doping limits, novel and ordered semiconductor alloys, and theoretical and experimental studies of properties of advanced semiconductor alloys for prototype solar cells. It also supports research addressing the fundamental understanding of solid-state, artificial photosynthetic systems. This research includes the preparation and study of novel dye-sensitized semiconductor electrodes, characterization of the photophysical and chemical properties of quantum dots, and study of charge carrier dynamics in semiconductors.

Oak Ridge Office

Introduction

The Oak Ridge Office (ORO) directly provides corporate support (i.e., procurement, legal, finance, budget, human resources, and facilities and infrastructure) to site offices responsible for program management oversight of two major management and operating laboratories: PNNL and TJNAF. Oak Ridge also oversees the Oak Ridge Reservation and other DOE facilities in the City of Oak Ridge. Together on the Reservation and in the City of Oak Ridge there are 26 buildings (363,000 square feet) with a total replacement plant value (RPV) of $29.2 million. The RPV of the roads and other structures on the Reservation is $48.3 million. As a result of the recent A-76 competition for financial services, the Oak Ridge Financial Service Center provides payment services for the entire Department of Energy/NNSA, nation-wide. The administrative, business and technical expertise of Oak Ridge is shared SC-wide through the Integrated Support Center concept. The ORO Manager is also the single Federal official with responsibility for contract performance at ORNL and the Oak Ridge Institute for Science and Education (ORISE). The Manager provides on-site presence for ORNL and ORISE with authority encompassing contract management, program and project implementation, Federal stewardship, and internal operations.

Science Laboratories Infrastructure

The Oak Ridge Landlord subprogram provides for centralized ORO infrastructure requirements and general operating costs for activities (e.g., roads) on the Oak Ridge Reservation outside plant fences plus DOE facilities in the town of Oak Ridge, PILT, and other needs related to landlord activities.

Safeguards and Security

The S&S program provides for contractor protective forces for the Federal office building and ORNL. This includes protection of a category 1 Special Nuclear Material Facility, Building 3019. Other small activities include security systems, information security, and personnel security.

Oak Ridge Institute for Science and Education

Introduction

The Oak Ridge Institute for Science and Education, operated by Oak Ridge Associated Universities (ORAU), is located on a 150-acre site in Oak Ridge, Tennessee. Established in 1946, ORAU is a university consortium leveraging the scientific strength of major research institutions to advance science and education by partnering with national laboratories, government agencies, and private industry. ORISE focuses on scientific initiatives to research health risks from occupational hazards, assess environmental cleanup, respond to radiation medical emergencies, support national security and emergency preparedness, and educate the next generation of scientists.

Basic Energy Sciences

ORISE supports a consortium of university and industry scientists to share the ORNL research station at NSLS to study the atomic and molecular structure of matter (known as ORSOAR, the Oak Ridge Synchrotron Organization for Advanced Research). ORISE provides administrative support for panel reviews and site reviews. It also assists with the administration of topical scientific workshops and provides administrative support for other activities such as for the reviews of construction projects. ORISE manages the **Shared Research Equipment (SHaRE)** program at ORNL. The SHaRE program makes available state-of-the-art electron beam microcharacterization facilities for collaboration with researchers from universities, industry, and other government laboratories.

Advanced Scientific Computing Research

ORISE provides support for education activities.

Biological and Environmental Research

ORISE coordinates research fellowship programs and manages the DOE-NSF program supporting graduate students to attend the Lindau Meeting of Nobel Laureates. It also coordinates activities associated with the peer review of most of the submitted research proposals. ORISE also conducts research into modeling radiation dosages for novel clinical diagnostic and therapeutic procedures.

High Energy Physics

ORISE provides support to the HEP program in the area of program planning and review.

Nuclear Physics

ORISE supports the Holifield Radioactive Ion Beam Facility (HRIBF) and its research program through a close collaboration with university researchers using HRIBF.

Fusion Energy Sciences

ORISE supports the operation of the Fusion Energy Sciences Advisory Committee (FESAC) and administrative aspects of some FES program peer reviews. It also acts as an independent and unbiased agent to administer the FES Graduate and Postgraduate Fellowship programs, in conjunction with FES, the ORO, participating universities, DOE laboratories, and industries.

Science Laboratories Infrastructure

The SLI program enables the cleanup and removal of excess facilities at the facility.

Science Program Direction

ORISE facilitates and coordinates communication and outreach activities, and conducts studies on workforce trends in the sciences.

Safeguards and Security

The S&S program at ORISE provides physical protection/protective force services by employing unarmed security officers. The facilities are designated as property protection areas for the purpose of protecting government-owned assets. In addition to the government-owned facilities and personal property, ORISE possesses small quantities of nuclear materials that must be protected. The program includes information security, personnel security, protective forces, security systems, and cyber security.

Oak Ridge National Laboratory

Introduction

The Oak Ridge National Laboratory is a multiprogram laboratory located on 24,000 acres in Oak Ridge, Tennessee. The laboratory's 1,100 acre main site on Bethel Valley Road contains 302 buildings (3.4 million gross square feet of space) with an average building age of 32 years. Scientists and engineers at ORNL conduct basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation's leadership in key areas of science; increase the availability of clean, abundant energy; restore and protect the environment; and contribute to national security. The laboratory supports almost every major Departmental mission in science, defense, energy resources, and environmental quality. It provides world-class scientific research capability while advancing scientific knowledge through such major Departmental initiatives as the Spallation Neutron Source (SNS), the Supercomputing Program, Nanoscience Research, complex biological systems, and ITER. In the defense mission arena, programs include those which protect our Homeland and National Security by applying advanced science and nuclear technology to the Nation's defense. Through the Nuclear Nonproliferation Program, Oak Ridge supports the development and coordination of the implementation of domestic and international policy aimed at reducing threats, both internal and external, to the U.S. from weapons of mass destruction. The Laboratory also supports various Energy Efficiency and Renewable Energy programs and facilitates the research and development of energy efficiency and renewable energy technologies.

Basic Energy Sciences

ORNL is home to major research efforts in materials and chemical sciences with additional programs in engineering and geosciences. It is the site of the High Flux Isotope Reactor (HFIR). ORNL also is the site of SNS, which is under construction and scheduled for commissioning in FY 2006. ORNL has perhaps the most comprehensive materials research program in the country.

The **High Flux Isotope Reactor** is a light-water cooled and moderated reactor that began full-power operations in 1966. HFIR operates at 85 megawatts to provide state-of-the-art facilities for neutron scattering, materials irradiation, and neutron activation analysis and is the world's leading source of elements heavier than plutonium for research, medicine, and industrial applications. The neutron scattering experiments at HFIR reveal the structure and dynamics of a very wide range of materials. The neutron-scattering instruments installed on the four horizontal beam tubes are used in fundamental studies of materials of interest to solid-state physicists, chemists, biologists, polymer scientists, metallurgists, and colloid scientists. Recently, a number of improvements at HFIR have increased its neutron scattering capabilities to 14 state-of-the-art neutron scattering instruments on the world's brightest beams of steady-state neutrons. These upgrades include the installation of larger beam tubes and shutters, a high-performance liquid hydrogen cold source, and neutron scattering instrumentation.

Advanced Scientific Computing Research

ORNL conducts basic research in the mathematics and computer science, as well as research in advanced computing software tools and collaboratory tools. It also participates in several scientific application and collaboratory pilot projects and participates on a number of the SciDAC teams. Advanced Computing Research Testbeds (ACRT) are focused on the evaluation of leading edge research computers. Integrated Software Infrastructure Center activities are focused on specific software challenges confronting users of terascale computers. The Center for Computational Sciences (CCS), located at ORNL, provides high-end capability computing services to SciDAC teams and other DOE users. ORNL was selected by DOE to develop leadership-class computing capability for science to revitalize the U.S. effort in high end computing.

Biological and Environmental Research

ORNL has a leadership role in research focused on the ecological aspects of global environmental change. The Throughput Displacement Experiment at the Walker Branch Watershed is a unique resource for long-term ecological experiments. ORNL is the home of a FACE experiment which facilitates research on terrestrial carbon processes and the development of terrestrial carbon cycle models. It also houses the ARM archive, providing data to ARM scientists and to the general scientific community. ORNL scientists provide improvement in formulations and numerical methods necessary to improve climate models. ORNL scientists make important contributions to the environmental remediation sciences research programs, providing special leadership in microbiology applied in the field. ORNL also manages the environmental remediation sciences research Field Research Center, a field site for developing and testing bioremediation methods for metal and radionuclide contaminants in subsurface environments. ORNL, in conjunction with ANL and PNNL and six universities, plays a principle role in the CSiTE consortium which is focusing on research to enhance the capacity, rates, and longevity of carbon sequestration in terrestrial ecosystems.

ORNL conducts research on widely used data analysis tools and information resources that can be automated to provide information on the biological function of newly discovered genes identified in high-throughput DNA sequencing projects. ORNL conducts microbial systems biology research as part of Genomics:GTL. The laboratory also operates the Laboratory for Comparative and Functional Genomics, or "Mouse House," which uses mice as model organisms to understand and characterize the human genome. The laboratory is developing a new experimental station for biological small angle neutron scattering. ORNL conducts research into the application of radioactively labeled monoclonal antibodies in medical diagnosis and therapy, particularly of cancer, as well as research into new instrumentation for the analytical chemistry of complex environmental contamination using new types of biosensors.

High Energy Physics

The HEP program supports a small research effort using unique capabilities of ORNL primarily in the area of particle beam shielding calculations. Through the SciDAC program, HEP also supports an effort at ORNL to model the physics processes that drive supernova explosions.

Nuclear Physics

The major effort at ORNL is the research, development, and operations of the HRIBF that is operated as a national user facility. Also supported are a relativistic heavy-ion group that is involved in a research program using the PHENIX detector at RHIC; the development of the Fundamental Neutron Physics Beamline at SNS; a theoretical nuclear physics effort that emphasizes investigations of nuclear structure and astrophysics; nuclear data and compilation activities that support the national nuclear data effort; and a technical effort involved in RIA R&D.

The **Holifield Radioactive Ion Beam Facility** is the only radioactive nuclear beam facility in the U.S. to use the isotope separator on-line (ISOL) method and is used annually by about 90 scientists for studies in nuclear structure, dynamics and astrophysics using radioactive beams. The HRIBF accelerates secondary radioactive beams to higher energies (up to 10 MeV per nucleon) than any other facility in the world with a broad selection of ions. The HRIBF conducts R&D on ion sources and low energy ion transport for radioactive beams.

Fusion Energy Sciences

ORNL develops a broad range of components that are critical for improving the research capability of fusion experiments located at other institutions and that are essential for developing fusion as an environmentally acceptable energy source. The laboratory is a leader in the theory of heating of plasmas by electromagnetic waves, antenna design, and design and modeling of pellet injectors to fuel the plasma and control the density of plasma particles. The laboratory is also the site of the Controlled Fusion Atomic Data Center and its supporting research programs. While some ORNL scientists are located full-time at off-site locations, others carry out their collaborations with short visits to the host institutions, followed by extensive computer communications from ORNL for data analysis and interpretation, and theoretical studies. ORNL is also a leader in stellarator theory and design and is a major partner with PPPL on the National Compact Stellarator Experiment (NCSX) being built at PPPL. ORNL, in partnership with PPPL, shares responsibility for managing the U.S. ITER Project Office, effective July 2004. ORNL has led the fusion materials science program, which is planned for termination in FY 2006.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

The S&S program includes security systems, information security, cyber security, personnel security, material control and accountability, and program management. Program planning functions at the laboratory provide for short- and long-range strategic planning, and special safeguards plans associated with both day-to-day protection of site-wide security interests and preparation for contingency operations. Additionally, ORNL is responsible for providing overall laboratory policy direction and oversight in the security arena; for conducting recurring programmatic self-assessments; for assuring a viable ORNL Foreign Ownership, Control or Influence (FOCI) program is in place; and for identifying, tracking, and obtaining closure on findings or deficiencies noted during inspections, surveys, or assessments of S&S programs.

Office of Scientific and Technical Information

The Office of Scientific and Technical Information (OSTI) is located on an 8-acre site in Oak Ridge, Tennessee. The 134,000 square foot OSTI facility houses both Federal and contractor staff; the E-Government infrastructure handling over 15 million downloads and views of DOE's R&D results per year; and over 1.2 million classified and unclassified documents dating from the Manhattan Project to the present. These resources enable OSTI to fulfill its mission to advance science and sustain technological creativity by making R&D findings available and useful to DOE researchers and the American people. OSTI hosts web sites for BER programs and maintains on-line databases.

Pacific Northwest Site Office

Introduction

The Pacific Northwest Site Office provides the single federal presence with responsibility for contract performance at PNNL. This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Pacific Northwest National Laboratory

Introduction

Pacific Northwest National Laboratory is a multiprogram laboratory located on 132 acres at the Department's Hanford site in Richland, Washington. The laboratory consists of one government-owned building (200,000 gross square feet of space) with the average age of the building being 7 years. PNNL conducts research in the area of environmental science and technology and carries out related national security, energy, and human health

Basic Energy Sciences

PNNL supports research in interfacial and surface chemistry, inorganic molecular clusters, analytical chemistry, and applications of theoretical chemistry to understanding surface. Geosciences research includes theoretical and experimental studies to improve our understanding of phase change phenomena in microchannels. Also supported is research on stress corrosion and corrosion fatigue, interfacial dynamics during heterogeneous deformation, irradiation assisted stress corrosion cracking, bulk defect and defect processing in ceramics, chemistry and physics of ceramic surfaces and interfacial deformation mechanisms in aluminum alloys.

Advanced Scientific Computing Research

PNNL conducts basic research in the mathematics and computer science, as well as research in advanced computing software tools and collaboratory tools. It also participates in several scientific application pilot projects, participates on a number of the SciDAC teams, and participates in Integrated Software Infrastructure Center activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

PNNL is home to the William R. Wiley **Environmental Molecular Sciences Laboratory (EMSL),** a national user facility. PNNL scientists, including EMSL scientists, play important roles in performing environmental remediation sciences research for the National and Accelerated Bioremediation Research (NABIR) and Environmental Management Science Program (EMSP). PNNL operates the unique ultrahigh field mass spectrometry and nuclear magnetic resonance spectrometry instruments at the EMSL for use by the national research community.

PNNL provides the G-1 research aircraft, and expertise in field campaigns for atmospheric sampling and analysis. The ARM program office is located at PNNL, as is the ARM chief scientist and the project manager for the ARM engineering activity; this provides invaluable logistical, technical, and scientific expertise for the program. It also conducts research into new instrumentation for microscopic imaging of biological systems and for characterization of complex radioactive contaminants by highly automated instruments.

PNNL conducts research on the molecular mechanisms of cell responses to low doses of radiation and on the development of high throughput approaches for characterizing all of the proteins (the proteome) being expressed by cells under specific environmental conditions. PNNL conducts microbial systems biology research as part of Genomics:GTL.

PNNL, in conjunction with ANL and ORNL and six universities, plays an important role in the CSiTE consortium, focusing on the role of soil microbial processes in carbon sequestration. PNNL also conducts research on the integrated assessment of global climate change.

Fusion Energy Sciences

PNNL has focused on research on materials that can survive in a fusion neutron environment. Experienced scientists and engineers at PNNL provide leadership in the evaluation of ceramic matrix composites for fusion applications and support work on vanadium, copper, and ferrite steels as part of the U.S. fusion materials team. These programs are planned for closeout in FY 2006. Another PNNL activity for FES is a small scale study of future fusion energy requirements.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

The PNNL S&S program consists of program management, physical security systems, protection operations, information security, cyber security, personnel security and material control and accountability.

Princeton Site Office

Introduction

The Princeton Site Office provides the single federal presence with responsibility for contract performance at the Princeton Plasma Physics Laboratory. This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Princeton Plasma Physics Laboratory

Introduction

Princeton Plasma Physics Laboratory is a program-dedicated laboratory (Fusion Energy Sciences) located on 88.5 acres in Plainsboro, New Jersey. The laboratory consists of 38 buildings (725,000 gross square feet of space) with an average building age of 29 years. DOE does not own the land.

Advanced Scientific Computing Research

PPPL participates in a collaboratory pilot project and several SciDAC projects.

High Energy Physics

The HEP program supports a small theoretical research effort at PPPL using unique capabilities of the laboratory in the area of advanced accelerator R&D.

Fusion Energy Sciences

PPPL is the only U.S. Department of Energy (DOE) laboratory devoted primarily to plasma and fusion science. The laboratory hosts experimental facilities used by multi-institutional research teams and also sends researchers and specialized equipment to other fusion facilities in the United States and abroad. PPPL is the host for the NSTX, which is an innovative toroidal confinement device, closely related to the tokamak, and has started construction of another innovative toroidal concept, the NCSX, a compact stellarator. PPPL scientists and engineers have significant involvement in the DIII-D and Alcator C-Mod tokamaks and the NSF Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas in the U.S. and several large tokamak facilities abroad, including JET (Europe), JT-60U (Japan), and

KSTAR (Korea). This research is focused on developing the scientific understanding and innovations required for an attractive fusion energy source. PPPL scientists are also involved in several basic plasma science experiments, ranging from magnetic reconnection to plasma processing. PPPL also has a large theory group that does research in the areas of turbulence and transport, equilibrium and stability, wave-plasma interaction, and heavy ion accelerator physics. PPPL, LBNL, and LLNL currently work together in advancing the physics of heavy ion drivers through the heavy ion beams Fusion Virtual National Laboratory. Effective July 2004, PPPL, in partnership with ORNL, was selected to manage the U.S. ITER Project Office. Through its association with Princeton University, PPPL provides high quality education in fusion-related sciences, having produced more than 185 Ph.D. graduates since its founding in 1951.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

The S&S program provides for protection of nuclear materials, government property, and other vital assets from unauthorized access, theft, diversion, sabotage, or other hostile acts. These activities result in reduced risk to national security and the health and safety of DOE and contractor employees, the public, and the environment.

Sandia Site Office

Sandia National Laboratories

Introduction

Sandia National Laboratories (SNL) is a multiprogram laboratory located on 3,700 acres in Albuquerque, New Mexico (SNL/NM), with sites in Livermore, California (SNL/CA), and Tonopah, Nevada.

Basic Energy Sciences

SNL is home to significant research efforts in materials and chemical sciences with additional programs in engineering and geosciences. SNL/CA is also the site of the Combustion Research Facility (CRF). SNL has a historic emphasis on electronic components needed for Defense Programs. The laboratory has very modern facilities in which unusual microcircuits and structures can be fabricated out of various semiconductors.

The **Combustion Research Facility** at SNL/CA is an internationally recognized facility for the study of combustion science and technology. In-house efforts combine theory, modeling, and experiment including diagnostic development, kinetics, and dynamics. Several innovative non-intrusive optical diagnostics such as degenerate four-wave mixing, cavity ring-down spectroscopies, high resolution optical spectroscopy, and ion-imaging techniques have been developed to characterize combustion intermediates. Basic research is often conducted in close collaboration with applied programs. A principal effort in turbulent combustion is coordinated among the chemical physics program, and programs in Fossil Energy and Energy Efficiency and Renewable Energy.

Advanced Scientific Computing Research

SNL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools and collaboratory tools. It also participates in several scientific application and collaboratory pilot projects, participates on a number of the SciDAC teams, and participates in ISIC activities that focus on specific software challenges confronting users of terascale computers.

Biological and Environmental Research

SNL provides the site manager for the North Slope of Alaska ARM site. The chief scientist for the ARM-Unmanned Aerial Vechicles (ARM-UAV) program is at SNL, and SNL takes the lead role in coordinating and executing ARM-UAV missions. The laboratory conducts advanced research and technology development in robotics, smart medical instruments, microelectronic fabrication of the artificial retina, and computational modeling of biological systems, and fundamental chemistry for the treatment of high-level waste.

To support environmental cleanup, SNL conducts research into novel sensors for analytical chemistry of contaminated environments. It also conducts computational and biological research in support of the Genomics:GTL research program.

Fusion Energy Sciences

Sandia plays a lead role in developing components for fusion devices through the study of plasma interactions with materials, the behavior of materials exposed to high heat fluxes, and the interface of plasmas and the walls of fusion devices. It selects, specifies, and develops materials for components exposed to high heat and particles fluxes and conducts extensive analysis of prototypes to qualify components before their use in fusion devices. Materials samples and prototypes are tested in Sandia's Plasma Materials Test Facility, which uses high-power electron beams to simulate the high heat fluxes expected in fusion environments. Materials and components are exposed to tritium-containing plasmas in the Tritium Plasma Experiment located in the STAR facility at INL. Tested materials are characterized using Sandia's accelerator facilities for ion beam analysis. Sandia supports a wide variety of domestic and international experiments in the areas of tritium inventory removal, materials postmortem analysis, diagnostics development, and component design and testing. Sandia also works with LBNL through the Heavy Ion-Fusion Virtual National Laboratory in developing high-brightness ion source and other science issues of heavy ion beams. Sandia serves an important role in the design and analysis activities related to the ITER first wall components, including related R&D.

Savannah River Site

Introduction

The Savannah River Site complex covers 198,344 acres, or 310 square miles encompassing parts of Aiken, Barnwell and Allendale counties in South Carolina bordering the Savannah River.

Biological and Environmental Research

SRS hosts the Savannah River Ecology Laboratory (SREL), a research unit of the University of Georgia operating at the site for over 50 years. SREL conducts research aimed at understanding the ecological impacts of DOE contamination and cleanup efforts. SREL is supported through a cooperative agreement with the University of Georgia.

Savannah River National Laboratory

The Savannah River National Laboratory (SRNL) is a multiprogram laboratory located on approximately 34 acres in Aiken, South Carolina. SRNL is SRS's applied R&D laboratory, providing technical support for the site's missions, working in partnership with the site's operating divisions.

Biological and Environmental Research

SRNL scientists make important contributions to the EMSP program, providing leadership on high level waste issues of importance to SRS, and generally relating to clean up of the nuclear weapons complex.

Stanford Site Office

Introduction

The Stanford Site Office provides the single federal presence with responsibility for contract performance at the Stanford Linear Accelerator Center (SLAC). This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Stanford Linear Accelerator Center

Introduction

The Stanford Linear Accelerator Center (SLAC) is located on 426 acres of Stanford University land in Menlo Park, California, and is also the home of the Stanford Synchrotron Radiation Laboratory (SSRL). The facility is now comprised of 25 experimental stations and is used each year by over 700 researchers from industry, government laboratories and universities. SLAC (including SSRL) consists of 166 buildings (1.9 million gross square feet of space) with the average age of 30 years. SLAC is a laboratory dedicated to the design, construction and operation of state-of-the-art electron accelerators and related experimental facilities for use in high-energy physics and synchrotron radiation research. SLAC operates the 2 mile long Stanford Linear Accelerator which began operating in 1966. The SSRL was built in 1974 to utilize the intense x-ray beams from the Stanford Positron Electron Accelerating Ring (SPEAR) that was built for particle physics by the SLAC laboratory. Over the years, SSRL grew to be one of the main innovators in the production and use of synchrotron radiation with the development of wigglers and undulators that form the basis of all third generation synchrotron sources.

Basic Energy Sciences

SLAC is the home of the **Stanford Synchrotron Radiation Laboratory** and peer-reviewed research projects associated with SSRL. The facility is used by researchers from industry, government laboratories, and universities. These include astronomers, biologists, chemical engineers, chemists, electrical engineers, environmental scientists, geologists, materials scientists, and physicists. A research program is conducted at SSRL with emphasis in both the x-ray and ultraviolet regions of the spectrum. SSRL scientists are experts in photoemission studies of high-temperature superconductors and in x-ray scattering. The SPEAR 3 upgrade at SSRL provides major improvements that will increase the brightness of the ring for all experimental stations.

Advanced Scientific Computing Research

SLAC participates on a number of SciDAC teams.

Biological and Environmental Research

SLAC operates nine SSRL beam lines for structural molecular biology. This program involves synchrotron radiation-based research and technology developments in structural molecular biology that focus on protein crystallography, x-ray small angle scattering diffraction, and x-ray absorption spectroscopy for determining the structures of complex proteins of many biological consequences. Beamlines at SSRL also serve the growing environmental science user community.

High Energy Physics

SLAC operates the **B-factory** and its detector, BaBar, and a small program of experiments in accelerator science and technology. The B-factory, a high energy electron-positron collider, was constructed to support a search for and high-precision study of CP symmetry violation in the B meson system. All of these facilities make use of the two-mile long linear accelerator, or linac. SLAC and Fermilab are the principal experimental facilities of the HEP program. The HEP program also supports physics research and technology R&D at SLAC, using unique resources of the laboratory, including engineering and detector technology, advanced accelerator technology, and computational resources.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

The S&S program focuses on reducing the risk to DOE national facilities and assets. The program consists primarily of protective forces and cyber security program elements.

Thomas Jefferson Site Office

Introduction

The Thomas Jefferson Site Office provides the single federal presence with responsibility for contract performance at TJNAF. This site office provides an on-site SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Thomas Jefferson National Accelerator Facility

Introduction

Thomas Jefferson National Accelerator Facility is a program-dedicated laboratory (Nuclear Physics) located on 200 acres in Newport News, Virginia dedicated to the exploration of nuclear and nucleon structure. The laboratory consists of 62 buildings (407,000 gross square feet of space) with an average building age of 13 years. Constructed over the period FY 1987-1995 at a cost of $513,000,000, TJNAF began operations in FY 1995.

Biological and Environmental Research

BER supports the development of advanced imaging instrumentation at TJNAF that will ultimately be used in the next generation medical imaging systems.

High Energy Physics

The HEP program supports an R&D effort at TJNAF on muon accelerator technology, using the unique expertise of the laboratory in the area of superconducting radiofrequency systems for particle acceleration.

Nuclear Physics

The centerpiece of TJNAF is the **Continuous Electron Beam Accelerator Facility (CEBAF)**, a unique international electron-beam user facility for the investigation of nuclear and nucleon structure based on the underlying quark substructure. The facility has a user community of ~1,200 researchers and is used annually by ~800 U.S. and foreign researchers. Polarized electron beams up to 5.7 GeV can be provided by CEBAF simultaneously to 3 different experimental halls. Hall A is designed for spectroscopy and few-body measurements. Hall B has a large acceptance detector, CLAS, for detecting multiple charged particles coming from a scattering reaction. Hall C is designed for flexibility to incorporate a wide variety of different experiments. Its core equipment consists of two medium resolution spectrometers for detecting high momentum or unstable particles. The G0 detector, a joint NSF-DOE project in Hall C, will allow a detailed mapping of the strange quark contribution to nucleon structure. Also in Hall C, a new detector, Q-weak, is being developed to measure the weak charge of the proton by a collaboration of laboratory and university groups in partnership with the NSF. TJNAF research and engineering staff are world experts in superconducting radio-frequency technology; their expertise is being used in the development of the 12 GeV Upgrade for CEBAF as well as for other accelerator projects such as the Spallation Neutron Source.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction and GPPs to maintain the general purpose infrastructure, the cleanup and removal of excess facilities, and the correction of health and safety deficiencies to ensure consistency with OSHA requirements.

Safeguards and Security

TJNAF has a guard force that provides 24-hour services for the accelerator site and after-hours property protection security for the entire site. Other security programs include cyber security, program management, and security systems.

Washington Headquarters

SC Headquarters, located in the Washington, D.C. area, supports the SC mission by funding Federal staff responsible for directing, administering, and supporting a broad spectrum of scientific disciplines. These disciplines include the HEP, NP, BES, BER, FES, ASCR, and WDTS programs. In addition, Federal staff are responsible for SC-wide management, operational policy, and technical/administrative support activities in budget and planning; information technology; infrastructure management; construction management; safeguards and security; environment, safety and health; and general administration. Funded expenses include salaries, benefits, travel, general administrative support services and technical expertise, information technology maintenance and enhancements, as well as other costs funded through interdepartmental transfers and interagency transfers.