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 thirty passenger motor vehicles for replacement only, $4,397,876,000, to remain available until expended.

Science
Office of Science

Overview

Appropriation Summary by Program

(dollars in thousands)

	FY 2006 Current Appropriation	FY 2007 Request	FY 2007 CR	FY 2008 Request
Science				
Basic Energy Sciences	1,110,148	1,420,980	1,197,084	1,498,497
Advanced Scientific Computing Research	228,382	318,654	234,514	340,198
Biological and Environmental Research	564,077	510,263	461,685	531,897
High Energy Physics	698,238	775,099	731,786	782,238
Nuclear Physics	357,756	454,060	396,166	471,319
Fusion Energy Sciences	280,683	318,950	305,151	427,850
Science Laboratories Infrastructure	41,684	50,888	41,986	78,956
Science Program Direction	159,118	170,877	161,469	184,934
Workforce Development for Teachers and Scientists	7,120	10,952	7,128	11,000
Small Business Innovation Research/Technology Transfer	116,813[a]	—	—	—
Safeguards and Security	73,630	76,592	73,636	76,592
Subtotal, Science	3,637,649	4,107,315	3,610,605	4,403,481
Less security charge for reimbursable work	-5,605	-5,605	-5,605	-5,605
Total, Science	3,632,044[b]	4,101,710	3,605,000	4,397,876
FTEs	949	1,014	989	1,058

Preface

As part of the second year of the President’s American Competitiveness Initiative, the Office of Science (SC) request for Fiscal Year (FY) 2008 is $4,397,876,000; an increase of $296,166,000, or 7.2%, over the FY 2007 request. The request funds investments in basic research that are important both to the future economic competitiveness of the United States and to the success of Department of Energy (DOE) missions in national security and energy security; advancing the frontiers of knowledge in the physical sciences and areas of biological, environmental, and computational sciences and providing world-class research facilities for the Nation’s science enterprise.

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[a] Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) includes $81,160,000 reprogrammed within Science plus $35,653,000 transferred from other DOE organizations.
[b] Total is reduced by $36,327,000 for a rescission in accordance with P.L. 109-148, the Emergency Supplemental Act to Address Hurricanes in the Gulf of Mexico and Pandemic Influenza, 2006

SC provides support for the basic research and scientific and technological capabilities that underpin the Department's technically complex missions. Part of this support is in the form of large-scale scientific user facilities. The suite of forefront facilities includes the world's highest energy proton accelerator (Fermi National Accelerator Laboratory's Tevatron) and the world's forefront neutron scattering facility (the Spallation Neutron Source at Oak Ridge National Laboratory), which began operations in 2006. SC facilities represent a continuum of unique capabilities that meet the needs of a diverse set of over 20,000 researchers each year. For example, the National Synchrotron Light Source (NSLS) began ultraviolet operations in 1982 and initially primarily enabled physical science research. However, through the 1990's the numbers of researchers from the life sciences rapidly grew as the characteristics of this facility better suited the needs of researchers who study protein structure. Today, the NSLS is playing a major role in the Protein Structure Initiative, a national effort to find the three-dimensional shapes of a wide range of proteins, while also providing a suite of beamlines to the soon to be available Center for Functional Nanomaterials and a host of other research efforts. The Department's five Nanoscale Science Research Centers and the computational resources at the National Energy Research Scientific Computing Center (NERSC) and Leadership Computing Facilities offer technological capabilities to the research community that are unmatched anywhere in the world.

The centerpiece of the American Competitiveness Initiative is President Bush's strong commitment to double investments over 10 years in key Federal agencies that support basic research programs in the physical sciences and engineering: SC, the National Science Foundation, and the Department of Commerce's National Institute for Standards and Technology core activities. While the American Competitiveness Initiative encompasses all SC funding, SC also supports other Presidential initiatives and priorities, such as the Advanced Energy Initiative, the Hydrogen Fuel Initiative, the National Nanotechnology Initiative, Networking and Information Technology Research and Development, the Climate Change Science Program, and ITER, an international nuclear fusion project.

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

Mission

SC's mission is to deliver the remarkable 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 supports basic research and technological capabilities that drive scientific discovery and innovation in the U.S. and underpin the Department's missions in energy, the environment, and national security. Important contributions to meeting DOE's applied mission needs are expected through developments in materials and chemical sciences, especially at the nanoscale, such as strong, tough, ductile, lightweight materials with low failure rates that will improve the fuel efficiency and innovative systems for harvesting light and storing energy that will dramatically improve solar energy conversion. The science, technology, and knowledge base developed from the Genomics: GTL program on understanding and harnessing the capabilities of microbial and plant systems could lead to cost-effective, renewable energy production, greater energy security, clean-up of legacy wastes, and tools for modifying concentrations of atmospheric CO_2 or for evaluating environmental impacts.

Computational modeling and simulation can improve our understanding of, and sometimes predict the behavior of complex systems and develop solutions to research problems that are insoluble by traditional or experimental approaches, too hazardous to study in the laboratory, or too time-consuming or expensive to solve by traditional means, including challenges such as understanding the fundamental processes associated with fluid flow and turbulence, chemical reactivity, climate modeling and prediction, molecular structure and processes in living cells, subsurface biogeochemistry, and astrophysics. Fusion, a fundamentally new source of energy under development, has the potential to provide a significant fraction of the world's energy by the end of the century. The international ITER project is a bold next step in fusion research, designed to produce, control, and sustain a burning plasma. Through investments in high-energy physics and nuclear physics, SC has historically provided the Nation with fundamental knowledge about the laws of nature as they apply to the basic constituents of matter and the forces between them. These investments in high energy and nuclear physics have enabled the U.S. to maintain a leading role in the development of technologies in areas such as nuclear energy, materials, semiconductors, nuclear medicine, and national security, and technologies such as the accelerator technologies leading to high-power x-ray light sources and advanced imaging techniques have been important to other fields of science.

Strategic Themes and Goals and GPRA Unit Program Goals

The Department's Strategic Plan identifies five Strategic Themes (one each for nuclear, energy, science, management, and environmental aspects of the mission) plus 16 Strategic Goals that tie to the Strategic Themes. Science supports the following goals:

Strategic Theme 3, Scientific Discovery and Innovation: Strengthening U.S. scientific discovery, economic competitiveness, and improving quality of life through innovations in science and technology.

Strategic Goal 3.1, Scientific Breakthroughs: Achieve the major scientific discoveries that will drive U.S. competitiveness; inspire America; and revolutionize our approaches to the Nation's energy, national security, and environmental quality challenges.

Strategic Goal 3.2, Foundations of Science: Deliver the scientific facilities, train the next generation of scientists and engineers, and provide the laboratory capabilities and infrastructure required for U.S. scientific primacy.

The programs funded by the Science appropriation have the following six GPRA Unit Program Goals which contribute to the Strategic Goals in the "goal cascade":

GPRA Unit Program Goal 3.1/2.50.00: 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.

GPRA Unit Program Goal 3.1/2.51.00: 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.

GPRA Unit Program Goal 3.1/2.48.00: 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.

GPRA Unit Program Goal 3.1/2.46.00: 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.

GPRA Unit Program Goal 3.1/2.47.00: 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.

GPRA Unit Program Goal 3.1/2.49.00: 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.

Contribution to Strategic Goals

Six of the programs within the Science appropriation directly contribute to Strategic Goals 3.1 and 3.2 as follows:

Basic Energy Sciences (BES) contributes to Strategic Goals 3.1 and 3.2 by producing advances in the core disciplines of basic energy sciences—materials sciences and engineering, chemistry, geosciences, and biosciences. The scientific discoveries at the frontiers of these disciplines impact energy resources, production, conservation, efficiency, and the mitigation of adverse impacts of energy production and use—discoveries that will help accelerate progress toward long-term energy independence, economic growth, and a sustainable environment. 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 electron beam micro-characterization centers. These facilities provide important capabilities for imaging and characterizing materials of all kinds from metals, alloys, and ceramics to semiconductors and fragile biological samples; and for studying the chemical transformation of materials. Construction of the Spallation Neutron Source was completed in FY 2006 and will enter its second full year of operation in FY 2008. Major items of equipment are supported in FY 2008 for the fabrication of approximately nine to ten additional instruments for the SNS. All five Nanoscale Science Research Centers will be operational in FY 2008—the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory, the Molecular Foundry at Lawrence Berkeley National Laboratory, the Center for Nanoscale Materials at Argonne National Laboratory, the Center for Integrated Nanotechnologies at Sandia National Laboratories and Los Alamos National Laboratory, and the Center for Functional Nanomaterials at Brookhaven National Laboratory. The Linac Coherent Light Source (LCLS) at SLAC will continue construction at the planned level, including partial support for the SLAC linac. The Transmission Electron Aberration Corrected Microscope project continues as a major item of equipment. Support is provided for research and development (R&D) and project engineering and design (PED) activities for the National Synchrotron Light Source–II (NSLS–II) to enable the study of material properties and functions, particularly materials at the nanoscale, at a level of detail and precision never before possible. BES will increase support for basic research for the President's Hydrogen Fuel Initiative solar energy utilization and electric-energy storage. BES also continues ongoing Scientific Discovery through Advanced Computing (SciDAC) efforts.

Advanced Scientific Computing Research (ASCR) contributes to Strategic Goals 3.1 and 3.2 by advancing fundamental mathematics and computer science research that enables simulation and prediction of complex physical, chemical, and biological systems; providing the advanced computational capabilities needed by researchers to take advantage of that understanding; and delivering the fundamental networking research and facilities that link scientists across the nation to the computing and experimental facilities. ASCR has been a leader in the computational sciences for several decades and supports research in applied mathematics, computer science, specialized algorithms, and scientific software tools that enable scientific discovery essential for research program across SC, as well as other elements of the Department. By the end of FY 2008, the Leadership Computing Facility at Argonne National Laboratory will expand to 250–500 teraflops of high performance computing capability with low electrical power needs to accelerate scientific understanding in areas that include materials science, biology, and advanced designs of nuclear reactors. The Leadership Computing Facility at Oak Ridge National Laboratory will acquire a 1 petaflop (quadrillions of processes per second) Cray Baker system in late FY 2008 to enable further scientific advancements. Delivery of the next generation of high performance resources at the National Energy Research Scientific Computing Center (NERSC) is scheduled for early FY 2007. This NERSC-5 system is expected to provide 100–150 teraflops of peak computing capacity. Expanded efforts in Applied Mathematics will support critical long term mathematical research issues relevant to petascale science, multiscale mathematics, and optimized control and risk analysis in complex systems. Expanded efforts in Computer Science will enable scientific applications to take full advantage of high-end computing systems at the Leadership Computing Facilities.

Biological and Environmental Research (BER) contributes to Strategic Goals 3.1 and 3.2 by advancing energy-related biological and environmental research in genomics and our understanding of complete biological systems, such as microbes that produce ethanol from cellulose; by developing models to predict climate over decades to centuries; by developing science-based methods for cleaning up environmental contaminants and for long-term stewardship of the sites; by providing regulators with a stronger scientific basis for developing future radiation protection standards; and by conducting limited research in medical imaging, radiotracers, and development of an artificial retina. Discoveries at these scientific frontiers may bring transformational and unconventional solutions to some of our most pressing and expensive problems in energy and the environment. BER continues the Genomics: GTL program as its top priority, employing a systems approach to biology at the interface of the biological, physical, and computational sciences for DOE’s energy security and environmental mission needs. As part of the GTL program, BER will continue to support the development of two Bioenergy Research Centers to be selected and initiated in FY 2007 and will add and support a third Center in FY 2008. All three centers will conduct comprehensive, multidisciplinary research programs focused on microbes and plants to drive scientific breakthroughs that will aid in the development of cost-effective biofuels and bioenergy production. The sequencing capacity of the Production Genomics Facility will increase in FY 2008 to support the growing demand and needs of the DOE research mission. Structural Biology infrastructure and innovative research on the biological effects of low dose radiation needed for future radiation protection standards will be sustained. BER continues as a partner in the interagency Climate Change Science Program focusing on understanding the principal uncertainties of the causes and effects of climate change, including abrupt climate change, understanding the global carbon cycle, developing predictive models for climate change over decades to centuries, and supporting basic research for biological sequestration of carbon. Basic research in Environmental Remediation continues to support fundamental research at the interfaces of biology, chemistry, geology, hydrology, and physics for solutions to environmental contamination challenges, including research for the development of two new field research sites providing new opportunities to validate laboratory findings under field conditions. Support for the Environmental Molecular Sciences Laboratory continues to provide integrated experimental and technological resources to the scientific community and support for instrumentation and operation of the three Atmospheric Radiation Measurement facilities continues.

High Energy Physics (HEP) contributes to Strategic Goals 3.1 and 3.2 by advancing understanding of the basic constituents of matter, deeper symmetries in the laws of nature at high energies, and mysterious phenomena that are commonplace in the universe, such as dark energy and dark matter. Research at these frontiers of science may uncover new particles, forces, or undiscovered dimensions of space and time; explain how matter came to have mass; and reveal the underlying nature of the universe. HEP supports particle accelerators and very sensitive detectors to study fundamental particle interactions at the highest possible energies as well as non-accelerator studies of cosmic particles using experiments conducted deep underground, on mountains, or in space. HEP places a high priority on maximizing scientific data derived from the three major HEP user facilities: the Tevatron Collider and Neutrinos at the Main Injector (NuMI) beam line at Fermilab, and the B-factory at SLAC. HEP will continue to lead the world with these forefront user facilities at Fermilab and SLAC in FY 2008, but these facilities will complete their scientific missions by the end of the decade. Thus the longer-term HEP program supported by this request begins to develop new cutting-edge facilities in targeted areas (such as neutrino physics) that will establish U.S. leadership in these areas in the next decade, when the centerpiece of the world HEP program will reside at CERN (the European Organization for Nuclear Research). HEP continues to support software and computing resources for U.S. researchers participating in the Large Hadron Collider (LHC) program at the CERN laboratory as well as pre-operations and maintenance of the U.S.-built systems that are part of the LHC detectors. HEP maintains support for International Linear Collider (ILC) R&D to support a U.S. role in a comprehensive and coordinated international R&D program, should the ILC be built. The NuMI Off-axis Neutrino Appearance (NOνA) Detector, which was originally proposed as a line item construction project in FY 2007 under the generic name of Electron Neutrino Appearance (EνA) Detector, continues in FY 2008. In addition, new Major Items of Equipment beginning fabrication in FY 2008 are the Dark Energy Survey project, a small experiment to measure neutrino interactions with ordinary matter in the NuMI beam (Main Injector Experiment ν–A [MINERνA]), and U.S. contributions to the Japanese Tokai-to-Kamioka (T2K) neutrino oscillation experiment. Activities to improve the intensity of the proton beam for the ongoing neutrino program at Fermilab continue and HEP supports further R&D on superconductive radiofrequency (RF) technologies in FY 2008.

Nuclear Physics (NP) contributes to Strategic Goals 3.1 and 3.2 by supporting 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 which hold the nucleus together and determine the detailed structure and behavior of the atomic nuclei. NP builds and supports world-leading scientific facilities and state-of-the-art instruments necessary to carry out its basic research agenda of fundamental nuclear physics and training a workforce relevant to the Department's missions for nuclear-related national security, energy, and environmental quality. NP also supports an effort in nuclear data that collects, evaluates, and disseminates nuclear physics data for basic nuclear research and for applied nuclear technologies, such as the design of next generation reactors. World-leading efforts on studies of hot, dense nuclear matter and the origin of the proton spin with beams at the Relativistic Heavy Ion Collider (RHIC) will continue, including implementation of required instrumentation to realize scientific goals. Construction of the Electron Beam Ion Source (EBIS) continues together with the National Aeronautics and Space Administration (NASA) to provide RHIC with more cost-effective, reliable operations and new research capabilities. In addition to RHIC efforts, the studies of hot, dense nuclear matter include NP contributions to enhance heavy ion capabilities of existing LHC experiments and the accompanying research program at universities and laboratories. Operations of the Continuous Electron Beam Accelerator Facility (CEBAF) are supported to provide high-energy electron beams to investigate a unique property called "confinement" that binds together the fundamental constituents of protons and neutrons, particles called quarks and gluons. The accelerator provides beams simultaneously to all three experimental halls to better understand the structure of the nucleon. Support is provided to complete project engineering and design of the 12 GeV Upgrade to CEBAF in FY 2008 as well as continue upgrade-related R&D activities. NP also continues efforts in nuclear structure/astrophysics, fundamental interactions, and neutrinos. Efforts at the Argonne Tandem Linac Accelerator System (ATLAS) and the Holifield Radioactive Ion Beam Facility (HRIBF) will be supported to focus on investigating new regions of nuclear structure, studying interactions in nuclear matter like those occurring in neutron stars, and determining the reactions that created the nuclei of the chemical elements inside stars and supernovae. R&D on rare isotope beam development, relevant for next-generation facilities in nuclear structure and astrophysics continues in FY 2008. Fabrication of the GRETINA gamma-ray tracking array, which will revolutionize gamma ray detection technology is supported in FY 2008 and will offer dramatically improved capabilities to study the structure of nuclei at ATLAS and HRIBF. The Fundamental Neutron Physics Beamline (FNPB) and neutron Electric Dipole Moment experiment under fabrication at the SNS continues and, when completed, will deliver record peak currents of cold neutrons and ultracold neutrons for studies of the fundamental properties of neutrons and search for new physics beyond the Standard Model. R&D and design activities are supported for neutrino-less Double Beta Decay experiments and funds are provided to initiate the fabrication of one of the candidate neutrino-less Double Beta Decay experiments, the Cryogenic Underground Observatory for Rare Events (CUORE), which will measure the absolute mass of the neutrino and determine whether the neutrino is its own antiparticle.

Fusion Energy Sciences (FES) contributes to Strategic Goals 3.1 and 3.2 by advancing the theoretical and experimental understanding of plasma and fusion science through its domestic research and development activities and a close collaboration with international partners on specialized facilities abroad, including ITER. In addition to supporting fundamental research into the nature of fusion plasmas, FES supports the operation of a set of unique and diversified experimental facilities. These facilities provide scientists with the means to test and extend our theoretical understanding and computer models—leading ultimately to improved predictive capabilities for fusion science. Advances in plasma physics and associated technologies will bring the U.S. closer to making fusion energy a part of the Nation’s energy solution. ITER, an experiment to study and demonstrate the scientific and technical feasibility of fusion power, is a multi-billion dollar international research project that will, if successful, move towards developing fusion’s potential as a commercially viable, clean, long-term source of energy near the middle of the century. FES continues to lead the U.S. Contributions to the ITER project and places increased emphasis on its national burning plasma program. The U.S. Contributions to the ITER project provides for the U.S. “in-kind” equipment contributions, U.S. personnel to work at the ITER site, and cash for the U.S. share of common expenses such as infrastructure, hardware assembly, installation, and contingency. The funding for ITER increases in FY 2008 to provide for procurements for fabrication of significant hardware components. Experimental research on tokamaks is continued in FY 2008, with continued emphasis on physics issues of interest to the ITER project. The DIII-D tokamak at General Atomics (a private company), will operate for 15 weeks in FY 2008 to conduct research relevant to burning plasma issues and topics of interest to the ITER project in addition to maintaining the broad scientific scope of the program. Operations at Alcator C-Mod at the Massachusetts Institute of Technology will be maintained at 15 weeks and operations at the National Spherical Torus Experiment (NSTX) at the Princeton Plasma Physics Laboratory (PPPL) will remain at 12 weeks. Fabrication of the major components of the National Compact Stellarator Experiment (NCSX) at PPPL continues and assembly of the entire device will be completed in FY 2009. FES will issue a joint solicitation in FY 2008, with the National Nuclear Security Administration (NNSA), focused on academic research in high energy density laboratory plasmas (HEDLP), which supports the Department’s programmatic goals in inertial confinement fusion science.

Funding by Strategic and GPRA Unit Program Goal

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Strategic Goals 3.1, Scientific Discovery and 3.2, Foundations of Science			
GPRA Unit Program Goal 3.1/2.50.00, Advance the Basic Science for Energy Independence (BES)	1,110,148	1,420,980	1,498,497
GPRA Unit Program Goal 3.1/2.51.00, Deliver Computing for Accelerated Progress in Science (ASCR)	228,382	318,654	340,198
GPRA Unit Program Goal 3.1/2.48.00, Harness the Power of Our Living World (BER)	564,077	510,263	531,897
GPRA Unit Program Goal 3.1/2.46.00, Explore the Fundamental Interactions of Energy, Matter, Time, and Space (HEP)	698,238	775,099	782,238
GPRA Unit Program Goal 3.1/2.47.00, Explore Nuclear Matter, from Quarks to Stars (NP)	357,756	454,060	471,319
GPRA Unit Program Goal 3.1/2.49.00, Bring the Power of the Stars to Earth (FES)	280,683	318,950	427,850
Subtotal, Strategic Goals 3.1, Scientific Discovery and 3.2, Foundations of Science	3,239,284	3,798,006	4,051,999
All Other			
Science Laboratories Infrastructure	41,684	50,888	78,956
Program Direction	159,118	170,877	184,934
Workforce Development for Teachers and Scientists	7,120	10,952	11,000
Small Business Innovation Research/Technology Transfer	116,813	—	—
Safeguards and Security	73,630	76,592	76,592
Total, All Other	398,365	309,309	351,482
Total, Strategic Goals 3.1 and 3.2 (Science)	3,637,649	4,107,315	4,403,481

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.

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." In general the FY 2005 assessment found that these SC Programs have developed a limited number of adequate performance measures. These measures have been incorporated into this Budget Request, grant solicitations, and the performance plans of senior managers. As appropriate, they are being incorporated into the performance-based contracts of management and operating (M&O) contractors.

SC has taken steps to enhance public understanding of our complex scientific performance measures by developing a PART website (http://www.sc.doe.gov/measures/) that answers questions such as "What does this measure mean?” and “Why is it important?” The Annual Performance Targets are tracked through the Department’s Joule system and reported in the Department’s Annual Performance and Accountability Report. Roadmaps with detailed information on tracking progress toward the long-term measures have been developed with the Scientific Advisory Committees and links to these reports are provided on SC’s PART website. The Scientific Advisory Committees are reviewing progress toward those measures vis-à-vis the roadmaps every three to five years. The first reviews are being conducted during FY 2006 and early FY 2007. Links to the results of these reviews will be provided on SC’s PART website as they become available.

OMB did not complete a PART for any SC Programs for the FY 2008 Budget, but has provided SC with recommendations to further improve performance. The improvement plan action items for the current fiscal year may be found at http://ExpectMore.gov (search by program name).

SC has incorporated this feedback from OMB into the FY 2008 Budget Request decision process, and will continue to take the necessary steps to improve performance.

Indirect Costs and Other Items of Interest

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 outside the plant fences or a telephone switch that serves the entire facility.

Examples of current year projects are:

- East Campus Parking Expansion design and construction at Oak Ridge National Laboratory. This project, scheduled for completion in FY 2006, will provide expanded parking capacity for the recently completed Third Party Buildings, Joint Institute for Computational Science/Oak Ridge Center for Advanced Studies, and Research Support Center, as well as the Multiprogram Research Facility. TEC: $3,500,000.
- 5000 Area Utility System Upgrades. This project will provide upgraded utility services for the Oak Ridge National Laboratory East Campus area to support expanded ORNL capability. TEC: $475,000.
- Campus Public Safety Camera System. This project will install video cameras on the exterior of all buildings on the Pacific Northwest National Laboratory campus to allow for monitoring, recording, assessment, and responding to events. Additionally, free standing emergency call stations will be installed to allow staff to immediately seek assistance or report events should the need arise. TEC: $2,326,070.

The following displays IGPP funding by site:

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Oak Ridge National Laboratory	10,000	16,000	16,000
Pacific Northwest National Laboratory	2,000	5,000	5,000
Argonne National Laboratory	—	—	2,000
Total, IGPP	12,000	21,000	23,000

Facilities Maintenance and Repair

The Department's facilities maintenance and repair activities are tied to its programmatic missions, goals, and objectives. Facilities Maintenance and Repair activities funded by the Office of Science or at SC laboratories are displayed in the following tables. SC has set maintenance targets for each of its laboratories to achieve overall facilities maintenance and repair levels consistent with the National Academy of Science recommendation of 2%–4% of replacement plant value for the SC laboratory complex.

Indirect-Funded Maintenance and Repair

Facilities maintenance and repair activities funded indirectly through overhead charges at SC laboratories are displayed below. Since this funding is allocated to all work done at each laboratory, these activities are paid for using funds from SC and other DOE organizations, as well other Federal agencies and other entities doing work at SC laboratories. Maintenance reported to SC for non-SC laboratories is also shown.

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Ames Laboratory	1,123	963	997
Argonne National Laboratory	27,386	28,323	28,974
Brookhaven National Laboratory	27,019	24,248	26,844
Fermi National Accelerator Laboratory	9,047	8,166	8,330
Lawrence Berkeley National Laboratory	16,920	13,000	15,904
Lawrence Livermore National Laboratory	2,760	2,850	2,887
Oak Ridge Institute for Science and Education	815	394	393
Oak Ridge National Laboratory	26,907	24,823	25,568
Oak Ridge National Laboratory facilities at Y-12	844	750	750
Office of Scientific and Technical Information	350	464	477
Pacific Northwest National Laboratory	1,865	1,800	1,631
Princeton Physics Plasma Laboratory	5,177	5,089	5,499
Sandia National Laboratory	1,946	1,999	2,045
Stanford Linear Accelerator Center	8,002	7,092	7,234
Thomas Jefferson National Accelerator Facility	2,811	2,622	2,674
Total, Indirect-Funded Maintenance and Repair	132,972	122,583	130,207

Direct-Funded Maintenance and Repair

Generally, facilities maintenance and repair expenses are funded through an indirect overhead charge. In some cases, however, a laboratory may charge maintenance directly to a specific program. An example of this might be if the maintenance were performed in a building used only by a single program. These direct-funded charges are nonetheless in the nature of indirect charges, and are not directly budgeted. The maintenance work for the Oak Ridge Office is direct funded and direct budgeted by the Science Laboratories Infrastructure program. A portion of the direct-funded maintenance and repair expenses reflects charges to non-SC programs performing work at SC laboratories.

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Brookhaven National Laboratory	2,009	2,337	2,384
Fermilab National Accelerator Facility	3,235	3,249	3,313
Notre Dame Radiation Laboratory	153	150	154
Oak Ridge Institute for Science and Education	54	—	—
Oak Ridge National Laboratory	21,483	17,542	18,068
Oak Ridge National Laboratory facilities at Y-12	75	75	75
Oak Ridge Office	1,891	2,019	2,065
Stanford Linear Accelerator Center	1,322	1,373	1,400
Thomas Jefferson National Accelerator Facility	50	51	52
Total, Direct-Funded Maintenance and Repair	30,272	26,796	27,511

Deferred Maintenance Backlog Reduction

SC is increasing focus on reducing the backlog of deferred maintenance at its laboratories as part of the Federal Real Property Initiative within the President’s Management Agenda. The deferred maintenance backlog at the end of FY 2006 is estimated to be $225,000,000. The Department’s goals for asset condition are based on the mission dependency of the asset. For example, the asset condition index target for mission critical facilities is 0.95 or above, where the index is computed as 1.0 minus the ratio of deferred maintenance to replacement plant value. To reduce the deferred maintenance backlog such that SC achieves the goals, SC sets targets for each of its laboratories for activities specifically focused on reduction of the backlog that exceeds Departmental goals. The overall target for deferred maintenance reduction funding is $36,000,000 in FY 2008, an increase of $16,200,000 over the planned level in the FY 2007 request. Deferred maintenance activities are primarily funded by the laboratories as overhead, charged to all uses of the laboratory facilities. These deferred maintenance estimates are in addition to funding of day-to-day maintenance and repair amounts shown in the tables above. In order to assure that new maintenance requirements are not added to the backlog, SC has set targets for our laboratories that, overall, exceed 2% of the SC laboratory complex replacement plant value, commensurate with the industry standard funding level recommended by the National Academy of Sciences of 2–4% of the replacement plant value. The tables below show the targets planned for funding of deferred maintenance backlog reduction.

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Argonne National Laboratory	—	2,574	1,983
Brookhaven National Laboratory	—	5,940	7,163
Fermi National Accelerator Laboratory	—	1,980	4,328
Lawrence Berkeley National Laboratory	—	2,178	6,069
Oak Ridge National Laboratory	—	5,544	14,400
Princeton Physics Plasma Laboratory	—	396	465
Stanford Linear Accelerator Center	—	792	686
Thomas Jefferson National Accelerator Facility	—	396	906
Total, Deferred Maintenance Backlog Reduction	—	19,800	36,000

SC Funding for Selected Administration Priorities

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
American Competitiveness Initiative	3,632,044	4,101,710	4,397,876
Advanced Energy Initiative	393,029	535,153	713,137
Hydrogen Fuel Initiative	32,500	50,000	59,500
Climate Change Science Program	130,461	126,187	129,585
Networking and Information Technology Research and Development	247,174	344,672	369,782
National Nanotechnology Initiative	204,893	256,914	285,586
ITER (TPC)	19,315	60,000	160,000

Science
Office of Science

Funding by Site by Program

(dollars in thousands)

	FY 2006	FY 2007	FY 2008
Ames Laboratory			
Basic Energy Sciences	21,300	20,857	20,963
Advanced Scientific Computing Research	1,450	562	562
Science Laboratories Infrastructure	150	—	—
Workforce Development for Teachers and Scientists	65	227	245
Safeguards and Security	607	570	670
Total, Ames Laboratory	23,572	22,216	22,440
Ames Site Office			
Science Program Direction	492	520	555
Argonne National Laboratory			
Basic Energy Sciences	173,641	190,810	200,250
Advanced Scientific Computing Research	13,956	28,174	33,570
Biological and Environmental Research	27,312	27,713	24,339
High Energy Physics	11,235	9,748	10,321
Nuclear Physics	20,900	23,682	25,400
Fusion Energy Sciences	990	960	1,000
Science Laboratories Infrastructure	1,246	3,500	6,469
Workforce Development for Teachers and Scientists	1,304	2,056	1,430
Safeguards and Security	8,570	8,462	8,462
Total, Argonne National Laboratory	259,154	295,105	311,241
Argonne Site Office			
Science Program Direction	3,680	3,813	4,125
Berkeley Site Office			
Science Program Direction	3,689	4,241	4,394

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Brookhaven National Laboratory			
Basic Energy Sciences	104,891	133,783	156,906
Advanced Scientific Computing Research	1,037	—	—
Biological and Environmental Research	20,935	18,074	16,735
High Energy Physics	38,894	30,193	31,962
Nuclear Physics	147,211	183,255	184,159
Science Laboratories Infrastructure	4,996	5,297	8,850
Workforce Development for Teachers and Scientists	682	1,013	739
Safeguards and Security	11,229	10,967	10,967
Total, Brookhaven National Laboratory	329,875	382,582	410,318
Brookhaven Site Office			
Science Program Direction	3,538	3,643	4,234
Chicago Office			
Basic Energy Sciences	164,847	130,351	137,149
Advanced Scientific Computing Research	41,421	18,164	19,664
Biological and Environmental Research	250,578	75,868	70,009
High Energy Physics	122,773	120,152	126,574
Nuclear Physics	59,664	61,664	63,658
Fusion Energy Sciences	137,000	129,817	138,417
Science Laboratories Infrastructure	1,228	1,520	1,520
Science Program Direction	24,707	26,162	26,060
Safeguards and Security	2,536	3,400	3,400
SBIR/STTR	116,813	—	—
Total, Chicago Office	921,567	567,098	586,451

	FY 2006	FY 2007	FY 2008
	(dollars in thousands)		
Fermi National Accelerator Laboratory			
Advanced Scientific Computing Research	1,255	—	—
High Energy Physics	326,630	320,367	349,678
Nuclear Physics	172	—	—
Fusion Energy Sciences	3	—	—
Science Laboratories Infrastructure	491	—	—
Workforce Development for Teachers and Scientists	50	308	300
Safeguards and Security	3,043	3,221	3,221
Total, Fermi National Accelerator Laboratory	331,644	323,896	353,199
Fermi Site Office			
Science Program Direction	2,235	2,346	2,496
Golden Field Office			
Basic Energy Sciences	4	4	4
Advanced Scientific Computing Research	3	—	—
Biological and Environmental Research	3	—	—
High Energy Physics	4	—	—
Nuclear Physics	3	—	—
Fusion Energy Sciences	3	—	—
Workforce Development for Teachers and Scientists	637	835	880
Total, Golden Field Office	657	839	884
Idaho National Laboratory			
Basic Energy Sciences	457	225	345
Biological and Environmental Research	1,611	1,190	867
Fusion Energy Sciences	2,380	2,334	2,322
Workforce Development for Teachers and Scientists	70	340	345
Total, Idaho National Laboratory	4,518	4,089	3,879

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Lawrence Berkeley National Laboratory			
Basic Energy Sciences	112,758	125,497	142,361
Advanced Scientific Computing Research	74,684	77,559	84,259
Biological and Environmental Research	74,111	72,671	68,807
High Energy Physics	46,303	44,812	41,831
Nuclear Physics	19,518	20,706	23,004
Fusion Energy Sciences	5,325	4,911	4,926
Science Laboratories Infrastructure	15,009	21,500	13,145
Workforce Development for Teachers and Scientists	673	885	804
Safeguards and Security	4,743	4,981	4,981
Total, Lawrence Berkeley National Laboratory	353,124	373,522	384,118
Lawrence Livermore National Laboratory			
Basic Energy Sciences	3,776	2,854	3,581
Advanced Scientific Computing Research	8,198	1,800	1,800
Biological and Environmental Research	24,154	25,209	22,455
High Energy Physics	2,266	2,196	2,174
Nuclear Physics	820	905	975
Fusion Energy Sciences	13,423	12,025	12,004
Science Laboratories Infrastructure	150	—	—
Workforce Development for Teachers and Scientists	—	78	200
Total, Lawrence Livermore National Laboratory	52,787	45,067	43,189
Los Alamos National Laboratory			
Basic Energy Sciences	27,662	21,993	21,490
Advanced Scientific Computing Research	4,052	2,075	2,075
Biological and Environmental Research	18,385	15,479	14,633
High Energy Physics	581	590	608
Nuclear Physics	8,421	10,515	12,260
Fusion Energy Sciences	4,024	3,356	3,042
Workforce Development for Teachers and Scientists	50	361	350
Total, Los Alamos National Laboratory	63,175	54,369	54,458

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
National Energy Technology Laboratory			
Basic Energy Sciences	12	—	—
Fusion Energy Sciences	125	—	—
Science Laboratories Infrastructure	275	—	—
Workforce Development for Teachers and Scientists	433	500	810
Total, National Energy Technology Laboratory	845	500	810
National Renewable Energy Laboratory			
Basic Energy Sciences	8,187	7,403	7,718
Advanced Scientific Computing Research	556	150	150
Biological and Environmental Research	584	875	594
Workforce Development for Teachers and Scientists	44	—	—
Total, National Renewable Energy Laboratory	9,371	8,428	8,462
NNSA Service Center/Albuquerque			
Biological and Environmental Research	800	—	—
Safeguards and Security	130	—	—
Total, NNSA Service Center/Albuquerque	930	—	—
New Brunswick Laboratory			
Science Program Direction	—	—	6,644
Oak Ridge Institute for Science and Education			
Basic Energy Sciences	3,401	810	660
Advanced Scientific Computing Research	1,584	—	—
Biological and Environmental Research	4,636	4,159	3,754
High Energy Physics	384	—	165
Nuclear Physics	770	703	673
Fusion Energy Sciences	1,225	788	1,400
Science Laboratories Infrastructure	768	—	—
Science Program Direction	117	—	—
Workforce Development for Teachers and Scientists	1,557	1,545	1,582
Safeguards and Security	1,359	1,489	1,489
Total, Oak Ridge Institute for Science and Education	15,801	9,494	9,723

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Oak Ridge National Laboratory			
Basic Energy Sciences	283,857	322,480	319,004
Advanced Scientific Computing Research	64,020	82,822	79,822
Biological and Environmental Research	42,270	36,266	31,844
High Energy Physics	225	182	289
Nuclear Physics	20,347	23,349	23,896
Fusion Energy Sciences	40,050	18,650[a]	177,236
Science Laboratories Infrastructure	1,283	8,047	8,618
Safeguards and Security	9,219	8,396	8,396
Total, Oak Ridge National Laboratory	461,271	500,192	649,105
Oak Ridge Office			
Basic Energy Sciences	80	80	80
Advanced Scientific Computing Research	80	—	—
Biological and Environmental Research	677	373	423
High Energy Physics	16	80	80
Nuclear Physics	532	—	—
Fusion Energy Sciences	80	—	90
Science Laboratories Infrastructure	5,028	5,079	5,079
Science Program Direction	42,534	44,252	44,150
Workforce Development for Teachers and Scientists	90	90	90
Safeguards and Security	16,286	17,975	17,975
Total, Oak Ridge Office	65,403	67,929	67,967

[a] $60,000,000 of FY 2007 ITER funding is reflected in the Princeton Plasma Physics Laboratory (PPPL), consistent with the FY 2007 request to Congress. FY 2006 and FY 2008 ITER funding is reflected within the Oak Ridge National Laboratory (ORNL).

	FY 2006	FY 2007	FY 2008
	(dollars in thousands)		
Pacific Northwest National Laboratory			
Basic Energy Sciences	15,587	15,182	15,183
Advanced Scientific Computing Research	8,164	350	350
Biological and Environmental Research	84,137	85,695	84,103
Fusion Energy Sciences	1,285	815	898
Science Laboratories Infrastructure	4,950	—	—
Workforce Development for Teachers and Scientists	882	1,035	947
Safeguards and Security	10,285	10,993	10,993
Total, Pacific Northwest National Laboratory	125,290	114,070	112,474
Pacific Northwest Site Office			
Science Program Direction	5,388	5,553	5,353
Princeton Plasma Physics Laboratory			
Advanced Scientific Computing Research	1,171	—	—
High Energy Physics	225	249	266
Fusion Energy Sciences	71,745	129,956[a]	71,647
Science Laboratories Infrastructure	119	—	—
Workforce Development for Teachers and Scientists	115	392	430
Safeguards and Security	1,919	1,953	2,053
Total, Princeton Plasma Physics Laboratory	75,294	132,550	74,396
Princeton Site Office			
Science Program Direction	1,618	1,668	1,759

[a] $60,000,000 of FY 2007 ITER funding is reflected in PPPL, consistent with the FY 2007 request to Congress. FY 2006 and FY 2008 ITER funding is reflected within ORNL.

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Sandia National Laboratories			
Basic Energy Sciences	34,353	43,822	43,453
Advanced Scientific Computing Research	5,611	2,595	2,595
Biological and Environmental Research	4,610	4,213	1,100
Nuclear Physics	25	—	—
Fusion Energy Sciences	2,389	1,655	1,665
Workforce Development for Teachers and Scientists	—	258	455
Total, Sandia National Laboratories	46,988	52,543	49,268
Savannah River National Laboratory			
Basic Energy Sciences	300	200	300
Biological and Environmental Research	934	691	321
Fusion Energy Sciences	20	—	—
Workforce Development for Teachers and Scientists	—	258	230
Total, Savannah River National Laboratory	1,254	1,149	851
Savannah River Operations Office			
Biological and Environmental Research	1,102	—	—
Stanford Linear Accelerator Center			
Basic Energy Sciences	152,942	215,469	190,498
Advanced Scientific Computing Research	102	—	—
Biological and Environmental Research	4,695	4,311	4,419
High Energy Physics	146,064	145,964	114,627
Science Laboratories Infrastructure	5,539	5,770	—
Workforce Development for Teachers and Scientists	140	150	303
Safeguards and Security	2,377	2,437	2,437
Total, Stanford Linear Accelerator Center	311,859	374,101	312,284
Stanford Site Office			
Science Program Direction	1,625	2,134	2,551

	(dollars in thousands)		
	FY 2006	FY 2007	FY 2008
Thomas Jefferson National Accelerator Facility			
Advanced Scientific Computing Research	120	—	—
Biological and Environmental Research	537	400	400
High Energy Physics	912	927	350
Nuclear Physics	78,358	96,371	102,437
Science Laboratories Infrastructure	175	—	—
Workforce Development for Teachers and Scientists	328	502	450
Safeguards and Security	1,231	1,311	1,311
Total, Thomas Jefferson National Accelerator Facility	81,661	99,511	104,948
Thomas Jefferson Site Office			
Science Program Direction	1,457	1,500	1,872
Washington Headquarters			
Basic Energy Sciences	2,093	189,160	238,552
Advanced Scientific Computing Research	918	104,403	115,351
Biological and Environmental Research	2,006	137,076	187,094
High Energy Physics	1,726	99,639	103,313
Nuclear Physics	1,015	32,910	34,857
Fusion Energy Sciences	616	13,683	13,203
Science Laboratories Infrastructure	277	175	35,275
Science Program Direction	68,038	75,045	80,741
Workforce Development for Teachers and Scientists	—	119	410
Safeguards and Security	96	437	237
Total, Washington Headquarters	76,785	652,647	809,033
Total, Science	3,637,649	4,107,315	4,403,481

Major Changes or Shifts by Site

Argonne National Laboratory

Basic Energy Sciences

- The **Center for Nanoscale Materials**, one of five DOE Nanoscale Science Research Centers, will be fully operational in FY 2008.

Advanced Scientific Computing Research

- The Leadership Computing Facility will be expanded to provide high-performance computing capability with low electrical power consumption to enable scientific advances.

Lawrence Berkeley National Laboratory

Basic Energy Sciences

- The Molecular Foundry, one of five DOE Nanoscale Science Research Centers, will be fully operational in FY 2008.
- Advanced Light Source (ALS) User Support Building (USB) will begin construction in FY 2008. The USB will provide user support space to accommodate the growth in the number of users and future expansion of the ALS.

Brookhaven National Laboratory

Basic Energy Sciences

- The **Center for Functional Nanomaterials**, one of five DOE Nanoscale Science Research Centers, will begin operations in FY 2008.

Los Alamos National Laboratory

Basic Energy Sciences

- The **Center for Integrated Nanotechnologies**, one of five DOE Nanoscale Science Research Centers, will be fully operational in FY 2008.

Oak Ridge National Laboratory

Basic Energy Sciences

- Construction of the **Spallation Neutron Source** (SNS) was completed on June 6, 2006. Over the next two to three years, the facility will continue to fabricate and commission instruments, funded both as part of the SNS project and from other sources including non-DOE sources, and will increase power to full levels. A new Major Item of Equipment to be initiated in FY 2007 will allow the fabrication of approximately four to five additional instruments for the SNS, thus nearly completing the initial suite of 24 instruments that can be accommodated in the high-power target station.
- The **Center for Nanophase Materials Sciences**, one of five DOE Nanoscale Science Research Centers, will be fully operational in FY 2008.

Fusion Energy Sciences

- In July 2004, a Oak Ridge National Laboratory (ORNL)/Princeton Plasma Physics Laboratory (PPPL) team was selected to host the U.S. ITER Project Office. In January 2006, based on the management successes of the SNS, ORNL was chosen as the lead laboratory to manage the U.S. Contributions to ITER, Major Item of Equipment project. ORNL has established an excellent Project Office team to manage the domestic activities and to engage the U.S. fusion community and industry to provide for the U.S. hardware contributions and personnel to the ITER Organization in Cadarache, France. ORNL has maintained active involvement in the international ITER Project activities in order to ensure consistency with the international and domestic project activities and schedule. There will be significant international cooperation between the U.S. ITER Project Office, the international ITER Organization, and other ITER parties.

Princeton Plasma Physics Laboratory

Fusion Energy Sciences

- In January 2006, based on the management successes of the Spallation Neutron Source, ORNL was chosen to replace PPPL as the lead laboratory to manage the U.S. Contributions to ITER, Major Item of Equipment project. PPPL continues to provide significant contributions to the ITER Preparations and the transition and startup of the U.S. Contributions to ITER project. PPPL is identified as a participating laboratory responsible for significant project activities of the U.S. ITER Project Office. There will be significant international cooperation and coordination between the U.S. ITER Project Office, the international ITER Organization, and other ITER parties.

New Brunswick Laboratory

Science Program Direction

- Beginning in FY 2008, New Brunswick Laboratory (NBL) is funded and administered by the Office of Science through the Chicago Office. Prior to FY 2008, the Office of Environment, Safety and Health funded NBL.

Sandia National Laboratories

Basic Energy Sciences

- The **Center for Integrated Nanotechnologies**, one of five DOE Nanoscale Science Research Centers, will be fully operational in FY 2008.

Stanford Linear Accelerator Center

Basic Energy Sciences and High Energy Physics

- Funding is provided by both Basic Energy Sciences and High Energy Physics to support operation of the Stanford Linear Accelerator Center (SLAC) linac. FY 2008 marks the third and final year of the transition from High Energy Physics to Basic Energy Sciences for SLAC linac operations funding, as B-factory operations complete in FY 2008 and the Linac Coherent Light Source operations start in FY 2009.

Site Description

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 12 buildings (327,664 gross square feet of space) with the average age of the buildings being 38 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 Scientific Discovery through Advanced Computing (SciDAC) science application teams.

Science Laboratories Infrastructure

The Science Laboratories Infrastructure (SLI) program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

Safeguards and Security

This program coordinates planning, policy, implementation, and oversight in the areas of security systems, protective forces, personnel security, program management, 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.

Ames Site Office

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 SC presence with authority encompassing contract management, program and project implementation, federal stewardship, and internal operations.

Argonne National Laboratory

Introduction

The Argonne National Laboratory (ANL) in Argonne, Illinois, is a multiprogram laboratory located on 1,500 acres in suburban Chicago. The laboratory consists of 99 buildings (4.4 million gross square feet of space) with an average building age of 35 years.

Basic Energy Sciences

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

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.

The **Center for Nanoscale Materials** provides capabilities for developing new methods for self assembly of nanostructures, exploring the nanoscale physics and chemistry of nontraditional electronic materials, and creating new probes for exploring nanoscale phenomena. The CNM is organized around six scientific themes: nanomagnetism, bio-inorganic hybrids, nanocarbon, complex oxides, nanophotonics, and theory and simulation.

Advanced Scientific Computing Research

ANL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools. ANL also participates in scientific application partnerships and contributes to a number of the SciDAC science application teams. Further, it participates in both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers. As part of the LCF activity, the ANL facility will be upgraded to 250-500 teraflops of high-performance computing with low electrical power consumption by the end of FY 2008 to advance science and will continue to focus on testing and evaluating leading edge computers.

Biological and Environmental Research

ANL conducts research on the molecular control of genes and gene pathways in microbes in addition to biological and geochemical research that supports environmental remediation. ANL operates beamlines for protein crystallography at the APS and also supports a growing community of users in environmental sciences.

In support of climate change research, ANL has oversight responsibility for coordinating the overall infrastructure operations of all three stationary Atmospheric Radiation Measure (ARM) sites to ensure consistency, data quality, and site security and safety. This includes infrastructure coordination of: communications, data transfer, and instrument calibration. ANL also provides the site manager for the Southern Great Plains site who is responsible for coordinating the day-to-day operations at that site. ANL also conducts research on aerosol processes and properties, and develops and applies software to enable efficient long-term climate simulations on distributed-memory multiprocessor computing platforms. In conjunction with ORNL, PNNL, and six universities, ANL is a participating laboratory in the Carbon Sequestration in Terrestrial Ecosystems (CSiTE) consortium, focusing on research to understand the processes controlling the rate of soil carbon accretion.

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 R&D 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); research programs at the Thomas Jefferson National Accelerator Facility (TJNAF), Fermi National Laboratory (Fermilab), Relativistic Heavy Ion Collider (RHIC), and Deutsches Elektronen-Synchrotron (DESY) in Germany investigating the structure of the nucleon; generic R&D in rare isotope beam development relevant for a next generation facility in nuclear structure and astrophysics; 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** National User 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 to 20% of the beams are exotic (rare isotope) 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 in rare isotope beam facilities. The combination of versatile beams and powerful instruments enables about 400 users annually at ATLAS to conduct research in a broad program in nuclear structure and dynamics, nuclear astrophysics, and fundamental interaction studies. The capabilities of ATLAS are being augmented by the fabrication of a Californium source to provide new capabilities in neutron-rich radioactive beams.

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 to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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, program management, and personnel security. In addition, a protective force is maintained. These activities ensure that the facility, personnel, and assets remain safe from potential threats.

Argonne Site Office

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.

Berkeley Site Office

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.

Brookhaven National Laboratory

Introduction

The Brookhaven National Laboratory (BNL) is a multiprogram laboratory located on 5,300 acres in Upton, New York. The laboratory consists of 336 SC buildings (3.8 million gross square feet of space) with an average building age of 36 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 research efforts in materials and chemical sciences as well as to efforts in geosciences and biosciences. It is also the site of one BES supported user facilities—the National Synchrotron Light Source (NSLS).The **National Synchrotron Light Source** 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 SciDAC science application teams. It also participates in SciDAC Centers for Enabling Technologies that focus on specific software challenges confronting users of petascale 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 in support of the Genomics: GTL program and on the molecular mechanisms of cell responses to low doses of radiation. BNL conducts molecular nuclear medicine research developing advanced medical imaging technologies including radiopharmaceuticals for medical imaging. The 2005 BER Distinguished Scientist for Medical Sciences is at BNL.

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 (ASP), including providing special expertise in conducting atmospheric field campaigns and aerosol research. The ASP chief scientist is at BNL. BNL scientists play a leadership role in the operation of the Free-Air Carbon Dioxide Enrichment (FACE) experiment at the Duke Forest which seeks to understand how plants respond to elevated carbon dioxide concentrations in the atmosphere.

BNL supports environmental remediation sciences research and is participating in the National Science Foundation (NSF)/DOE Environmental Molecular Sciences Institute at the State University of New York-Stony Brook and has instituted a new internal initiative, EnviroSuite, to support a growing community of environmental users who are supported at NSLS.

High Energy Physics

The HEP program supports physics research and technology research and development (R&D) at BNL, using unique resources of the laboratory, including engineering and technology for future accelerators and detectors, 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—parts of which are coordinated with the RIKEN BNL Research Center funded by Japan; development of future detectors for RHIC; R&D of electron-cooling accelerator technology aimed at increasing the RHIC beam luminosity; a small exploratory research activity directed towards the heavy ion program at the Large Hadron Collider (LHC); research on the properties of neutrinos at the Sudbury Neutrino Observatory (SNO); a theory program emphasizing RHIC heavy ion and "spin" physics; 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 1,200 scientists from 19 countries. RHIC uses 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 "quarkgluon 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 were 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. A barrel Time of Flight detector upgrade (STAR TOF) is being added to significantly extend the particle identification capability of STAR detector. (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. Scientists using the other two smaller detectors, Phobos and Broad RAnge Hadron Magnetic Spectrometer (BRAHMS), have completed their data acquisition programs and focus on data analysis. International participation has been essential in the implementation of all four 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. 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 **Tandem Van de Graaff** accelerators which serve as injectors for the Booster Synchrotron will be replaced by a modern, compact Electron Beam Ion Source (EBIS) and linac system which promises greater efficiency, greater reliability, and lower maintenance costs as well as the potential for future upgrades. The EBIS is a joint DOE/NASA project.

The **National Nuclear Data Center** 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 to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

Safeguards and Security

The Safeguards and Security (S&S) program activities are focused on protective forces, cyber security, personnel security, security systems, information security, program management, 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.

Brookhaven Site Office

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.

Chicago Office

Introduction

The Chicago (CH) 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. CH 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 CH is shared SC-wide through the Integrated Support Center concept. CH 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 190 academic institutions located in 48 states.

Advanced Scientific Computing Research

The Advanced Scientific Computing Research (ASCR) program funds research at over 70 colleges/universities supporting over 130 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 190 research grants at 85 colleges/universities located in 34 states and the District of Columbia. Among these are grants with the Triangle Universities Nuclear Laboratory (TUNL) which includes the High Intensity Gamma Source (HIGS) at the Duke Free Electron Laser Laboratory; Texas A&M (TAMU) Cyclotron; the Yale Tandem Van de Graaff; University of Washington Center for Experimental Nuclear and Particle Astrophysics (CENPA) and the Institute for Nuclear Theory (INT); and the Research and Engineering (R&E) Center at the Massachusetts Institute for Technology. The first three of these include accelerator facilities which 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. The CENPA and R&E Center have unique infrastructure ideal for pursuing instrumentation projects important to the NP mission. The Institute for Nuclear Theory (INT) is a premier international center for new initiatives and collaborations in nuclear theory research.

Fusion Energy Sciences

The Chicago Office supports the Fusion Energy Sciences (FES) program by implementing grants and cooperative agreements for research at more than 50 colleges and universities located in approximately 30 states. It also supports the FES program by implementing a cooperative agreement and grants for the DIII-D tokamak experiment and related programs at General Atomics, an industrial firm located in San Diego, California.

Fermi National Accelerator Laboratory

Introduction

Fermi National Accelerator Laboratory is a program-dedicated laboratory (High Energy Physics) located on a 6,800-acre site in Batavia, Illinois. The laboratory consists of 346 buildings (2.3 million gross square feet of space) with an average building age of 40 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 2,200 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 participates in some SciDAC science application teams and in SciDAC Centers for Enabling Technologies that focus on specific software challenges confronting users of petascale computers.

High Energy Physics

Fermilab is the principal experimental facility for HEP. 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 Collider is the highest energy proton accelerator in the world, and will remain so until the LHC begins operation at CERN late this decade. The Tevatron complex also includes the **Neutrinos at the Main Injector (NuMI)** beamline, the world's highest intensity neutrino beam facility, which started operation in 2005. The HEP program also supports physics research and technology R&D at Fermilab, using unique resources of the laboratory, including state-of-the-art engineering and technology for future generations of accelerators and detectors and computational resources.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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, program management, security systems, and material control and accountability programs to accurately account for and protect the facility's special nuclear materials.

Fermi Site Office

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

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.

Advanced Scientific Computing Research

INL participates in SciDAC science application teams.

Biological and Environmental Research

INL is conducting research in subsurface science relating to clean up of the nuclear weapons complex with an emphasis on understanding coupled processes affecting contaminant transport.

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.

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 107 buildings (1.5 million gross square feet of space) with an average building age of 37 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 three Basic Energy Sciences (BES) supported user facilities—the Advanced Light Source (ALS), the Molecular Foundry, 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. An ALS User Support Building (USB) will begin construction in FY 2008. The USB will provide high-quality user support space in sufficient quantity to accommodate the very rapid growth in the number of ALS users and to accommodate projected future expansion. The USB will contain staging areas for ALS experiments, space for a long beamline that will extend from the floor of the ALS into the USB, and temporary office space for visiting users.

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.

The **Molecular Foundry** provides users with instruments, techniques, and collaborators to enhance the study of the synthesis, characterization, and theory of nanoscale materials. Its focus is on the multidisciplinary development and understanding of both “soft” (biological and polymer) and “hard” (inorganic and microfabricated) nanostructured building blocks and the integration of these building blocks into complex functional assemblies. Scientific themes include inorganic nanostructures; nanofabrication; organic, polymer, and biopolymer nanostructures; biological nanostructures; imaging and manipulation of nanostructures; and theory of nanostructures. The facility offers expertise in a variety of techniques for the study of nanostructures, including electronic structure and excited-state methods, *ab initio* and classical molecular dynamics, quantum transport, and classical and quantum Monte Carlo approaches. Several research laboratories at LBNL with capabilities that complement those at the facilities also are open to Foundry users.

Advanced Scientific Computing Research

LBNL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools. LBNL also participates in several SciDAC science application teams, and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers. LBNL manages the 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.

Biological and Environmental Research

LBNL is one of the major national laboratory partners forming the Joint Genome Institute (JGI), the principal goal of which is high-throughput DNA sequencing techniques. The laboratory also conducts research on the molecular mechanisms of cell responses to low doses of radiation and on microbial systems biology research as part of Genomics: GTL program. The Chief Scientist for the Low Dose Radiation Research program and the 2005 BER Distinguished Scientists for Environmental Remediation and for Life Sciences are at LBNL. LBNL operates beam lines for determination of protein structure at the ALS for use by the national and international biological research community. The ALS also supports and is used by a growing environmental science community. LBNL supports environmental remediation sciences research and provides geophysical, biophysical, and biochemical research capabilities for field sites in that program and is participating in the NSF/DOE Environmental Molecular Sciences Institute at Pennsylvania State University.

LBNL conducts research on carbon cycling and carbon sequestration on terrestrial ecosystems. It also conducts research on biological and ecological responses to climatic and atmospheric changes.

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

LBNL supports a variety of activities focused primarily in the low energy and heavy ion NP subprograms. These include fabrication of a next-generation gamma-ray detector system, GRETINA; research with the STAR detector located at Brookhaven’s RHIC facility; development of future detector systems for RHIC; operation of the Parallel Distributed Systems Facility aimed at heavy ion and low energy physics computation; fabrication activities directed towards a detector upgrade for the ALICE detector heavy ion program at the Large Hadron Collider (LHC) at Organisation Européanne pour la Recherche Nucléaire (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 theory program with an emphasis on relativistic heavy ion physics; data compilation and evaluation activities supporting the National Nuclear Data Center at BNL; and a technical effort in generic R&D of rare isotope beam development with the development of electron-cyclotron resonance (ECR) ion sources. The 88-Inch Cyclotron at the LBNL is a facility for testing electronic circuit components for radiation “hardness” to cosmic rays, supported by the National Reconnaissance Office (NRO) and the U.S. Air Force (USAF), and for a small in-house research program supported by NP.

Fusion Energy Sciences

LBNL has been conducting research in developing ion beams for applications to high energy density physics in the near term (4 to 10 years) and inertial fusion energy in the long term. Currently the laboratory has two major experimental systems for doing this research: the Neutralized Drift Compression Experiment (NDCX) and the High Current Experiment (HCX). Both experiments are directed at answering the question of how ion beams can be produced with the intensity required for research in high energy density physics and inertial fusion. LBNL conducts this research together with the Lawrence Livermore National Laboratory and Princeton Plasma Physics Laboratory through the Heavy Ion Fusion Science Virtual National Laboratory.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

Safeguards and Security

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

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. LLNL also participates in several SciDAC science application teams and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers.

Biological and Environmental Research

LLNL is one of the major national laboratory partners that comprise the Joint Genome Institute (JGI), the principal goal of which is high-throughput DNA sequencing. 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.

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 aerosol properties and processes and climate change feedbacks on carbon cycling. The 2005 BER Distinguished Scientist for Climate Change Research is at LLNL.

High Energy Physics

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

Nuclear Physics

The LLNL program supports research in relativistic heavy ion physics as part of the PHENIX collaboration at RHIC and the ALICE experiment at the CERN LHC, in nuclear data and compilation activities, in R&D of neutrinoless double beta decay experiments, on theoretical nuclear structure studies, and a technical effort involved in generic R&D of rare isotope beam development.

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. In addition, LLNL carries out research in support of magnets and plasma chamber and plasma-material interactions.

Science Laboratories Infrastructure

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

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 a few 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.

LANL is also the site of two BES supported user facilities: the Manuel Lujan Jr. Neutron Scattering Center (Lujan Center) and the Center for Integrated Nanotechnologies (CINT).

The **Manuel Lujan Jr. Neutron Scattering 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.

The **Center for Integrated Nanotechnologies** provides tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the microworld and the macroworld. CINT is devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials. Through its core facility in Albuquerque, New Mexico, and its gateways to both Sandia National Laboratories and Los Alamos National Laboratory, CINT will provide access to tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the microworld and the macroworld. CINT supports five scientific thrusts that serve as synergistic building blocks for integration research: nano-bio-micro interfaces, nanophotonics and nanoelectronics, complex functional nanomaterials, nanomechanics, and theory and simulation.

Advanced Scientific Computing Research

LANL conducts basic research in mathematics and computer science and in advanced computing software tools. LANL also participates in several SciDAC science application teams, and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers.

Biological and Environmental Research

LANL is one of the major national laboratory partners that comprise the JGI, the principal goal of which is 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 conducts research in optical imaging as part of the artificial retina project

In support of BER's climate change research, LANL manages the day-to-day operations at the Tropical Western Pacific ARM site. In addition, LANL manages the deployment and operation of the ARM mobile facility. LANL also has a crucial role in the development, optimization, and validation of coupled sea ice and oceanic general circulation models and coupling them to atmospheric general circulation models for implementation on massively parallel computers.

LANL also conducts research under environmental remediation sciences with an emphasis on biological processes associated with plutonium mobility in the environment. LANL is participating in the NSF/DOE Environmental Molecular Sciences Institute at Pennsylvania State University.

High Energy Physics

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

Nuclear Physics

NP supports a broad program of research including: a program of neutron beam research that utilized beams from the LANSCE facility to make fundamental physics measurements (completed in 2007); the fabrication of an experiment to search for the electric dipole moment of the neutron to be located at the Fundamental Neutron Physics Beamline at the SNS; 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 U.S. Nuclear Data program; and a technical effort involved in rare isotope beam development.

Fusion Energy Sciences

LANL has developed a substantial experimental system for research in Magnetized Target Fusion, one of the major innovative confinement concepts in magnetic alternates. The laboratory leads research in a high-density, compact plasma configuration called Field Reversed Configuration. LANL supports the creation of computer codes for modeling the stability of magnetically confined plasmas, including tokamaks and innovative confinement concepts. The work also provides 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. The laboratory is also doing research in Inertial Electrostatic Confinement, another innovative confinement concept. LANL also supports the tritium processing activities needed for ITER.

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.

Advanced Scientific Computing Research

NREL participates in SciDAC science application teams including efforts focused on computational nanoscience.

New Brunswick Laboratory

The New Brunswick Laboratory (NBL) is a government-owned, government-operated center for analytical chemistry and measurement science of nuclear materials. In this role, NBL performs measurements of the elemental and isotopic compositions for a wide range of nuclear materials. The NBL is the U.S. Government's Nuclear Materials Measurements and Reference Materials Laboratory and the National Certifying Authority for nuclear reference materials and measurement calibration standards. NBL provides reference materials, measurement and interlaboratory measurement evaluation services, and technical expertise for evaluating measurement methods and safeguards measures in use at other facilities for a variety of Federal program sponsors and customers. The NBL also functions as a Network Laboratory for the International Atomic Energy Agency. The NBL is administered through and is a part of the Chicago Office.

Oak Ridge Institute for Science and Education

Introduction

The Oak Ridge Institute for Science and Education (ORISE), 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 administrative support for panel reviews, site reviews, and Advanced Scientific Computing Advisory Committee meetings. It also assists with the administration of topical scientific workshops.

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 the research proposals and applications submitted to BER.

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, ORO, participating universities, DOE laboratories, and industries.

Science Laboratories Infrastructure

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

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, program management, 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 the 24,000 acre reservation at Oak Ridge, Tennessee. The laboratory's 1,100 acre main site on Bethel Valley Road contains 286 buildings (3.4 million gross square feet of space) with an average building age of 36 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 R&D 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. ORNL has perhaps the most comprehensive materials research program in the country. It is also the site of three BES supported user facilities—the Spallation Neutron Source (SNS), which completed construction and began operations in FY 2006; the High Flux Isotope Reactor (HFIR); and the Center for Nanophase Materials Sciences (CNMS).

The **Spallation Neutron Source** is a next-generation short-pulse spallation neutron source for neutron scattering that is significantly more powerful (by about a factor of 10) than the best spallation neutron source now in existence. The SNS consists of a linac-ring accelerator system that delivers short (microsecond) proton pulses to a target/moderator system where neutrons are produced by a process called spallation. The neutrons so produced are then used for neutron scattering experiments. Specially designed scientific instruments use these pulsed neutron beams for a wide variety of investigations. There is initially one target station that can accommodate 24 instruments; the potential exists for adding more instruments and a second target station later.

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.

The **Center for Nanophase Materials Sciences** integrates nanoscale science with neutron science; synthesis science; and theory, modeling, and simulation. Scientific themes include macromolecular complex systems, functional nanomaterials such as carbon nanotubes, nanoscale magnetism and transport, catalysis and nano building blocks, and nanofabrication.

Advanced Scientific Computing Research

ORNL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools. ORNL also participates in several SciDAC science application teams, and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale 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 Computing Facility (LCF) 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. It supports basic research through ecosystem-scale manipulative experiments in the field, through laboratory experiments involving model ecosystems exposed to global change factors, and through development and testing of computer simulation models designed to explain and predict effects of climatic change on the structure and functioning of terrestrial ecosystems. 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, 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 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 (FRC). The FRC is a field site for support of research on the complex interactions between physical and biological process that impact the mobility of metal and radionuclide contaminants in subsurface environments.

ORNL is one of the major national laboratory partners that comprise the JGI, the principal goal of which is high-throughput DNA sequencing. One of ORNL's roles in the JGI involves the annotation (assigning biological functions to genes) of completed genomic sequences and mouse genetics. 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."

High Energy Physics

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

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 and ALICE at the LHC; 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 rare isotope beam development.

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 235 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 targets and ion sources and low energy ion transport for radioactive beams. The capabilities of HRIBF were augmented by the fabrication of the High Power Test Laboratory (HPTL) which provides capabilities unique in the world for the development and testing of new ion source techniques. The fabrication of a second source and transport beam-line (IRIS2) for radioactive ions will improve efficiencies and reliabilities.

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 fusion materials science, 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. In July 2004, an ORNL/PPPL team was selected to host the U.S. ITER Project Office. In January 2006, based on the management successes of the Spallation Neutron Source, ORNL was chosen as the lead laboratory to manage the U.S. Contributions to ITER, Major Item of Equipment project.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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.

Oak Ridge Office

Introduction

The Oak Ridge (OR) Office 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: Pacific Northwest National Laboratory and Thomas Jefferson National Accelerator Facility. OR also oversees the OR Reservation and other DOE facilities in the City of Oak Ridge. Together on the Reservation and in the City of Oak Ridge there are 32 buildings (184,317 square feet) with an average age of 49 years and a total replacement plant value (RPV) of $29.0 million. The RPV of the roads and other structures on the Reservation is $47.5 million. The OR Financial Service Center provides payment services for the entire Department of Energy/NNSA, nation-wide. The administrative, business, and technical expertise of OR is shared SC-wide through the Integrated Support Center concept. The OR 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 maintains Oak Ridge Reservation infrastructure such as roads outside plant fences as well as DOE facilities in the town of Oak Ridge, PILT, and other needs related to landlord responsibilities.

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.

Pacific Northwest National Laboratory

Introduction

Pacific Northwest National Laboratory is a DOE multiprogram laboratory located in Richland, Washington that supports DOE's science, national security, energy, and homeland security missions. PNNL operates the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL)—a 200,000 sq. ft. national scientific user facility constructed by DOE that houses 373 people. PNNL also utilizes 29 Federal facilities in the 300 Area of the Hanford Reservation (700,000 sq. ft. of space that house nearly 1,000 people). These facilities provide nearly 50% of the PNNL's laboratory space and 100% of its nuclear and radiological facilities. In addition, PNNL operates facilities on land owned by it's parent organization, Battelle Memorial Institute (494,000 sq. ft.), and leases an additional 793,000 sq. ft. of office space in the Richland area occupied by 2,330 staff.

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 mathematics and computer science, as well as research in advanced computing software tools. PNNL also participates in several SciDAC science application teams and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers.

Biological and Environmental Research

PNNL is home to the William R. Wiley **Environmental Molecular Sciences Laboratory (EMSL),** a national scientific user facility. PNNL operates EMSL, which provides unique ultra high field mass spectrometry and nuclear magnetic resonance spectrometry instruments, as well as a wide variety of other cutting edge analytical capabilities for use by the national research community. PNNL conducts a wide variety of research in subsurface environmental remediation science, with emphases on biogeochemistry and fate and transport of radionuclides. PNNL is participating in the National Science Foundation (NSF)/DOE Environmental Molecular Sciences Institutes at Pennsylvania State University and Stanford University. It also conducts research into new instrumentation for microscopic imaging of biological systems.

PNNL provides expertise in research on aerosol properties and processes and in field campaigns for atmospheric sampling and analysis of aerosols. PNNL also conducts climate modeling research to improve the simulations of both precipitation through representation of sub-grid orography and the effect of aerosols on climate at regional to global scales. The Atmospheric Radiation Measurement (ARM) program office is located at PNNL, as is the project manager for the ARM engineering activity; this provides invaluable logistical, technical, and scientific expertise for the program. PNNL manages the ARM Aerial Vehicles Program (AAVP) as well. PNNL also conducts research on improving methods and models for assessing the costs and benefits of climate change and of various different options for mitigating and/or adapting to such changes. 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.

PNNL is one of the major national laboratory partners that comprise the JGI, the principal goal of which is high-throughput DNA sequencing. One of PNNL's roles in the JGI involves proteomics research (identifying all the proteins found in cells). 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. The Chief Scientist for the Genomics: GTL program is at PNNL.

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.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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.

Pacific Northwest Site Office

The Pacific Northwest Site Office provides the single federal presence with responsibility for contract performance at Pacific Northwest National 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 (PPPL) is a program-dedicated laboratory (Fusion Energy Sciences) located on 88.5 acres in Plainsboro, New Jersey. The laboratory consists of 36 buildings

(721,000 gross square feet of space) with an average building age of 32 years. DOE does not own the land.

Advanced Scientific Computing Research

PPPL participates in SciDAC science application teams related to fusion science.

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 National Spherical Torus Experiment (NSTX), which is an innovative toroidal confinement device, closely related to the tokamak, and has started construction of another innovative toroidal concept, the National Compact Stellarator Experiment (NCSX). 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., as well as 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. In January 2006, based on the management successes of the Spallation Neutron Source, ORNL was chosen as the lead laboratory to manage the U.S. Contributions to ITER, Major Item of Equipment project, with PPPL supporting them. Through its association with Princeton University, PPPL provides high quality education in fusion-related sciences, having produced more than 200 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 to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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. The PPPL S&S program consists of protective forces, security systems, cyber security, and program management.

Princeton Site Office

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.

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. It is also the site of two BES supported user facilities—the Combustion Research Facility (CRF) and the Center for Integrated Nanotechnologies (CINT).

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.

The **Center for Integrated Nanotechnologies** provides tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the microworld and the macroworld. CINT is devoted to establishing the scientific principles that govern the design, performance, and integration of nanoscale materials. Through its core facility in Albuquerque, New Mexico, and its gateways to both Sandia National Laboratories and Los Alamos National Laboratory, CINT will provide access to tools and expertise to explore the continuum from scientific discovery to the integration of nanostructures into the microworld and the macroworld. CINT supports five scientific thrusts that serve as synergistic building blocks for integration research: nano-bio-micro interfaces, nanophotonics and nanoelectronics, complex functional nanomaterials, nanomechanics, and theory and simulation.

Advanced Scientific Computing Research

SNL conducts basic research in mathematics and computer science, as well as research in advanced computing software tools. SNL also participates in several SciDAC science application teams, and both SciDAC Centers for Enabling Technologies and SciDAC Institutes that focus on specific software challenges confronting users of petascale computers.

Biological and Environmental Research

In support of BER’s climate change research, SNL provides the site manager for the North Slope of Alaska ARM site who is responsible for day-to-day operations at that site. In addition, SNL conducts climate modeling research on modifying the Community Atmospheric Model (CAM) to support new dynamical cores and improve its scalability for implementation on high-system computing systems. 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.

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 National Laboratory

Introduction

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

Biological and Environmental Research

SRNL scientists support environmental remediation sciences research program in the area of subsurface contaminant fate and transport.

Stanford Linear Accelerator Center

Introduction

The Stanford Linear Accelerator Center (SLAC) is located on 426 acres of Stanford University land in Menlo Park, California. 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 photon science and has operated the 2 mile long Stanford Linear Accelerator (Linac) since 1966. SLAC consists of 115 buildings (1.7 million gross square feet of space) with the average age of 29 years. In addition, SLAC will become the site of the world's first x-ray laser, the Linac Coherent Light Source (LCLS) in 2009, and funding for operations of the SLAC Linac is transitioning from High Energy Physics to Basic Energy Sciences, with full funding by Basic Energy Sciences starting in FY 2009. SLAC houses the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC), which is an independent laboratory of Stanford University.

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 provided major improvements that increase the brightness of the ring for all experimental stations.

Advanced Scientific Computing Research

SLAC participates in SciDAC science application teams such as the Particle Physics Data Grid.

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 support a 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. SLAC is also working at the frontier of particle astrophysics. In 2006, SLAC completed construction of the detector for the Gamma Ray Large Array Telescope (GLAST) which will be launched into earth orbit in 2007. SLAC physicists and a user community will analyze the GLAST data till at least 2012. About 1,200 particle physicists throughout the U.S. and around the world, use SLAC for their research. 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 to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

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, security systems, program management, and cyber security program elements.

Stanford Site Office

The Stanford Site Office provides the single federal presence with responsibility for contract performance at the Stanford Linear Accelerator Center. 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 an Office of Science laboratory (Nuclear Physics) located on 206 acres (DOE-owned) in Newport News, Virginia focused on the exploration of nuclear and nucleon structure. The laboratory consists of 64 buildings (474,000 gross square feet of space) with an average building age of 15 years, 2 state leased buildings, 23 real property trailers, and 10 other structures and facilities. The laboratory was constructed over the period FY 1987–1995.

Advanced Scientific Computing Research

TJNAF participates in SciDAC science application teams such as the Particle Physics Data Grid.

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 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 an international user community of about 1,200 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, allows 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 supports a group that does theoretical calculations and investigations in subjects supporting the experimental research programs in Medium Energy Physics. TJNAF research and engineering staff are world experts in Superconducting Radio-Frequency (SRF) accelerator technology; their expertise is being used in the development of the 12 GeV Upgrade for CEBAF and International Linear Collider, and was utilized for the completed the Spallation Neutron Source. The 12 GeV CEBAF Upgrade is being implemented and will provide researchers with the opportunity to study quark confinement, one of the greatest mysteries of modern physics.

Science Laboratories Infrastructure

The SLI program enables Departmental research missions at the laboratory by funding line item construction to maintain the general purpose infrastructure, and the cleanup and removal of excess facilities.

Safeguards and Security

TJNAF has a guard force (protective 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, material control and accountability, and security systems.

Thomas Jefferson Site Office

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

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.