Corporate Context for
Science (SC) Programs

This section on Corporate Context that is included for the first time in the Department's budget is provided to facilitate the integration of the FY 2003 budget and performance measures. The Department's Strategic Plan published in September 2000 is no longer relevant since it does not reflect the priorities laid out in President Bush's Management Agenda, the 2001 National Energy Policy, OMB's R&D project investment criteria or the new policies that will be developed to address an ever evolving and challenging terrorism threat. The Department has initiated the development of a new Strategic Plan due for publication in September 2002, however that process is just beginning. To maintain continuity of our approach that links program strategic performance goals and annual targets to higher level Departmental goals and Strategic Objectives, the Department has developed a revised set of Strategic Objectives in the structure of the September 2000 Strategic Plan.

For the past 50 years, U.S. taxpayers have earned an enormous return on their investment in the basic research sponsored by the Department of Energy's Office of Science. The science underlying a multitude of discoveries – ranging from advanced energy and environmental technologies that reduce consumer electricity bills while protecting the environment, to great leaps in our knowledge of how the universe originated – has flowed out of the national laboratories and universities where DOE-sponsored scientists conduct their research. During Fiscal Year 2003, DOE will continue this legacy of discovery through strategic investments in basic research and the major national scientific user facilities that the Office of Science builds and operates on behalf of the Nation.

The events of 2001, particularly the war on terrorism, underscore the continuing need for sustained investments in basic research. DOE's accomplishment of its missions in national security, energy, and environment rely upon advances in basic research that are managed by the Office of Science. This basic research – which encompasses such diverse fields as materials sciences, chemistry, high energy and nuclear physics, plasma science, plant sciences, biology, advanced computation, and environmental studies – is contributing to effective counter measures in the war on terrorism, the Administration's goal of U.S. energy independence, and the overall vitality of the U.S. science and technology enterprise.

Science (SC) Goal

Deliver the scientific knowledge and discoveries for DOE's applied missions; advance the frontiers of the physical sciences and areas of the biological, environmental and computational sciences; and provide world-class research facilities and essential scientific human capital to the Nation's overall science enterprise.

Strategic Objectives

SC1: Determine whether the Standard Model accurately predicts the mechanism that breaks the symmetry between natural forces and generates mass for all fundamental particles by 2010 or whether an alternate theory is required, and on the same timescale determine whether the absence of antimatter in the universe can be explained by known physics phenomena. (HEP)

SC2: By 2015, describe the properties of the nucleon and light nuclei in terms of the properties and interactions of the underlying quarks and gluons; by 2010, establish whether a quark-gluon plasma can be created in the laboratory and, if so, characterize its properties; by 2020, characterize the structure and reactions of nuclei at the limits of stability and develop the theoretical models to describe their properties, and characterize using experiments in the laboratory the nuclear processes within stars and supernovae that are needed to provide an understanding of nucleosynthesis. (NP)

SC3: By 2010, develop the basis for biotechnology solutions for clean energy, carbon sequestration, environmental cleanup, and bioterrorism detection and defeat by characterizing the multiprotein complexes that carry out biology in cells and by determining how microbial communities work as a system; and determine the sensitivity of climate to different levels of greenhouse gases and aerosols in the atmosphere and the potential resulting consequences of climate change associated with these levels by resolving or reducing key uncertainties in model predictions of both climate change that would result from each level and the associated consequences. (BER)

SC4: Provide leading scientific research programs in materials sciences and engineering, chemical sciences, biosciences, and geosciences that underpin DOE missions and spur major advances in national security, environmental quality, and the production of safe, secure, efficient, and environmentally responsible systems of energy supply; as part of these programs, by 2010, establish a suite of Nanoscale Science Research Centers and a robust nanoscience research program, allowing the atom-by-atom design of revolutionary new materials for DOE mission applications; and restore U.S. preeminence in neutron scattering research and facilities. (BES)

SC5: Enable advances and discoveries in DOE science through world-class research in the distributed operation of high performance, scientific computing and network facilities; and to deliver, in 2006, a suite of specialized software tools for DOE scientific simulations that take full advantage of terascale computers and high speed networks. (ASCR)

SC-6: Advance the fundamental understanding of plasma, the fourth state of matter**,** and enhance predictive capabilities, through the comparison of well-diagnosed experiments, theory and simulation; for MFE, resolve outstanding scientific issues and establish reduced-cost paths to more attractive fusion energy systems by investigating a broad range of innovative magnetic confinement configurations; advance understanding and innovation in high-performance plasmas, optimizing for projected power-plant requirements; develop enabling technologies to advance fusion science, pursue innovative technologies and materials to improve the vision for fusion energy; and apply systems analysis to optimize fusion development; for IFE, leveraging from the ICF program sponsored by the National Nuclear Security Agency's Office of Defense Programs, advance the fundamental understanding and predictability of high energy density plasmas for IFE. (FES)

SC7: Provide major advanced scientific user facilities where scientific excellence is validated by external review; average operational downtime does not exceed 10% of schedule; construction and upgrades are within 10% of schedule and budget; and facility technology research and development programs meet their goals. (Crosscutting all major programs.)

SC8: Ensure efficient SC program management of research and construction projects through a re-engineering effort of SC processes by FY 2003 that will support world class science through systematic improvements in SC's laboratory physical infrastructure, security, and ES&H. (Covers the following accounts: Energy Research Analysis, Science Laboratories Infrastructure, Science Program Direction, Science Education, Field Operations, Safeguards and Security, Technical Information)

Office of Science

Executive Summary

The Office of Science (SC) requests $3,285,088,000 for the Fiscal Year 2003 Science appropriation, an increase of $4,349,000 over FY 2002, to conduct the basic research that underpins Department of Energy (DOE) applied technology programs; advance the frontiers of the physical sciences and areas of biological, environmental and computational sciences; and, provide world-class research facilities for the Nation's science enterprise. Setting aside funds for the Spallation Neutron Source and projects that required one-time funding in FY 2002, science funding increases by about 5 percent. For the Technical Information Management program in the Energy Supply appropriation, $8,353,000 is requested, an increase of $304,000 over FY 2002.

SC's FY 2003 investments in basic research respond to U.S. and DOE priorities in national defense, energy security and environmental quality. In addition, SC supports the U.S. science and technology base through investments in fundamental research, such as high energy and nuclear physics, and the construction and operation of major scientific facilities that are used annually by more than 17,000 researchers. The FY 2003 budget request for SC is compared to the FY 2002 Appropriation in Figure 1 below.

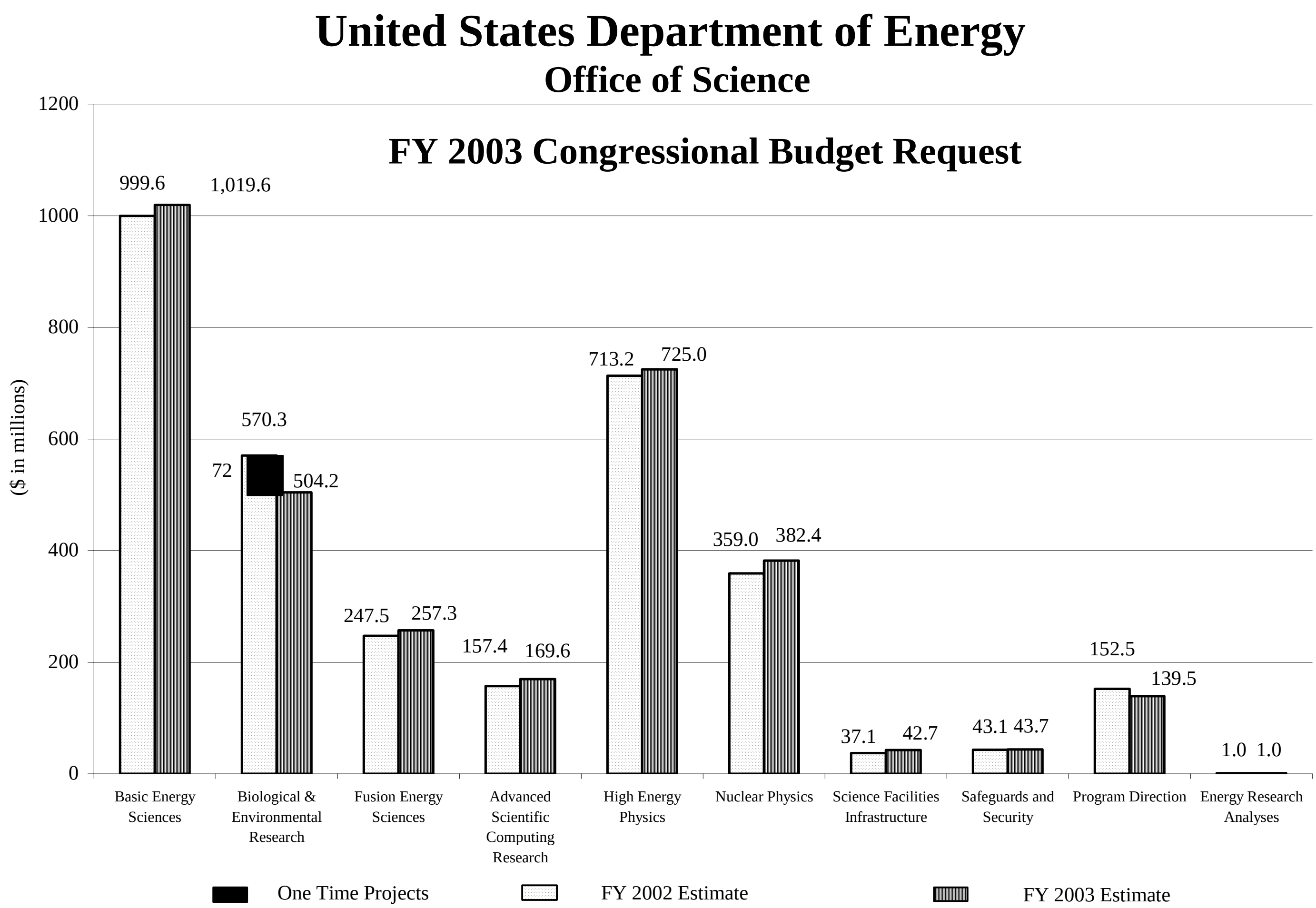

Figure 1

FY 2003 Priorities – Strategic Investments in Knowledge and Discovery

SC basic research underpins DOE's applied technology programs through strategic investments that fuel discoveries in materials sciences, chemistry, plasma science, plant sciences, biology, computation and environmental studies. In addition, SC sponsors leading edge research in physics and other areas that extend the frontiers of knowledge and discovery. Through these investments in basic research, SC is tackling some of the most challenging scientific questions of the 21st century.

SC researchers, for example, are manipulating the smallest components of matter to create the world's tiniest machines, which could lead to major advances in energy production, manufacturing processes, medical devices and computational capabilities; they are using decades of accumulated knowledge in the life sciences and advanced computation to fully understand a variety of biological processes to clean up the environment and defeat biological terrorism; and they are exploring the origins of mass, including searching for the mysterious and elusive "Higgs boson," (expected to be key to understanding mass) and ways to synthesize an extreme form of matter that existed for only a fraction of a second after the Big Bang.

Specifically, the FY 2003 request supports:

- ***Advanced scientific user facilities to accomplish vital DOE and national missions.*** SC will design, build, and operate scientific user facilities for university, laboratory, and industry researchers, providing U.S. scientists with the tools needed to secure our national defense, promote energy security, make advances in health, and increase U.S. technological competitiveness. During the next five years, SC will design and/or complete new research tools. Examples include the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory and NuMI at Fermilab. The U.S. will be restored to a position of leadership in neutron scattering research after the SNS becomes operational in FY 2006.

- ***Nanoscale science to make significant leaps in energy production and other DOE mission areas.*** SC will be part of a Federal government effort to establish international leadership in nanoscale science, enabling the atom-by-atom design of materials and integrated systems that will lead to important contributions to U.S. national security, energy production and environmental quality. Nanoscale science is the next major frontier in materials sciences, chemistry, biology, engineering, and a host of other scientific disciplines. Advancing basic knowledge in nanoscale science, and drawing on SC's unique core competencies and recognized interdisciplinary capabilities, will enable SC and its Federal partners (NSF, DoD, etc.) to secure international leadership in this emerging area of science.

- ***Genomes to Life in support of DOE missions in energy, national security, and environmental quality.*** Scientific breakthroughs and knowledge in gene function and protein structure that create new biological approaches will be used to address DOE's missions. This will be accomplished through an understanding of the genetic and environmental basis of normal and abnormal cell function, and the development of tools to understand gene function and protein structure needed for biotechnology solutions for clean energy, carbon sequestration, environmental cleanup, and bioterrorism detection and defeat.

- ***Climate Change Research.*** SC will contribute to the Administration's global climate change goals by resolving or reducing key uncertainties in predicting the effects of human activities on climate. SC will provide the foundation to predict, assess and mitigate potential adverse effects of energy production and use on the environment through research in climate modeling, climate processes, carbon cycle and carbon sequestration, atmospheric chemistry, and ecological science.

- ***Innovation in fusion/plasma science and technologies as part of the Administration's National Energy Policy.*** Fusion offers the potential for abundant, safe, environmentally attractive, affordable energy. Research in the science and the technology of fusion has progressed to the point that the next major step in the program is the exploration of the physics of a self-sustained fusion reaction, or a burning plasma physics experiment. SC will conduct research that supports such an experiment. In addition, SC will explore innovative approaches to confining, heating, and fueling plasmas.

- ***Fundamental research to resolve two key questions about the nature of matter and energy.*** SC is exploring two significant elements of the Standard Model, the current accepted theory of matter and energy, and it's validity in explaining the fundamental forces in the universe, including the complex interactions of energy, matter, time and space**.** SC's High Energy Physics (HEP) program has a unique opportunity during the next five years to make a key discovery that will help scientists worldwide understand the origin of mass in the universe, one of the great unsolved questions in physics. Until the Large Hadron Collider in Europe becomes operational sometime after 2005, the HEP program is the only one in the world with facilities capable of detecting the elusive Higgs Boson (expected to be key to understanding mass). Additionally, one of the persistent mysteries of modern physics is the general absence of observed anti-matter in the universe – a puzzle that HEP could resolve within the next five years by explaining the role of Charge-Parity (CP) violation.

- ***Attempts to synthesize an extreme form of matter that only existed for a fraction of a second at the Big Bang – the Quark-Gluon Plasma.*** The Nuclear Physics program is working to synthesize for the first time in a laboratory the extreme state of matter that existed microseconds after the Big Bang: a Quark-Gluon Plasma. This scientific achievement will reveal the nature and behavior of the most fundamental building blocks of matter. Now that SC's Relativistic Heavy Ion Collider (RHIC) facility is fully operational, intensive study is underway that could lead to the human-made creation and discovery of an extreme form of matter (Quark-Gluon Plasma) that existed just after the Big Bang at the start of the universe. This discovery would pave the road to a fuller understanding of our universe and how basic matter and energy processes can be explained.

- ***A new era of scientific discovery through advances in computation.*** SC initiated the Scientific Discovery through Advanced Computing (SciDAC) program to exploit advances in computing and information technologies as tools for scientific discovery across SC's research programs. SciDAC encourages and enables a new model of multi-discipline collaboration among the scientific disciplines, computer scientists and mathematicians to develop a new generation of scientific simulation codes that can fully exploit terascale computing and networking resources. SciDAC's goal is to bring simulation to a level of parity with experiment and theory in the scientific research enterprise as demonstrated by the production of breakthrough scientific results in climate prediction, plasma physics, particle physics, astrophysics and computational chemistry.

Science for DOE and the Nation

The importance of Federal support to the sciences was underscored by President Bush in an April 2001 speech to the high-tech industry:

"Science and technology have never been more essential to the defense of the nation and the health of our economy."
President George W. Bush

SC is one of the primary government sponsors of basic research in the United States, and leads the Nation in supporting the physical sciences. SC's primary responsibility is to be an effective manager of scientific disciplines and scientific resources that are focused on vital DOE and national priorities. The President's affirmation of the importance of Federal investments in science and technology continues an unbroken line of support by our Nation's leaders for the sciences that stretches back 56 years – a line of support that parallels the history of SC and its predecessors.

In FY 2003 SC will continue its long history of effective project and program management to ensure that DOE and national missions are accomplished. SC's responsibilities as a manager of Federal science investments have resulted in the integration of the SC national laboratories into a system that contributes on a daily basis to our Nation's scientific and technological advances; support for world-class scientists at these laboratories and at U.S. research universities in the conduct of peer-reviewed and competitively selected research in areas of national priority; and the construction and operation of major scientific user facilities (such as high intensity X-ray sources and massively parallel computer centers) for the Nation's scientists. SC's basic research programs facilitate interactions among researchers in universities, industries, Federal laboratories, and the private sector to ensure that the full value of the Nation's research base is focused on meeting DOE's missions.

> *"Scientific progress is one key to our security as a nation, to our better health, to more jobs, to a higher standard of living, and to our cultural progress."*
>
> **Vannevar Bush, Science Advisor to President Truman, July 1945**

SC responsibilities on behalf of the Nation's scientific enterprise focus on four major areas:

- ***Advancing major national priorities***. SC's basic research programs have made major contributions to U.S. technological success in supercomputing, climate change science, and a host of other areas. In the energy arena, for example, SC researchers provided the scientific basis for rechargeable microbatteries, energy-efficient refrigeration, low-loss transformers, clean-burning engines, wear-resistant coatings, high-efficiency solar collectors and solar cells, high-temperature superconducting wires, solid state lasers, and intermetallic alloys. This record of success has been well documented and can be found on the Office of Science's web page at:
  http://www.sc.doe.gov/feature_articles_2001/June/Decades/

  Performance Indicator: Office of Science funded scientists are annually awarded major scientific prizes for their ground-breaking research. For example, SC and its predecessor agencies have funded the work of dozens of Nobel Laureates. Most recently, SC funded the work of the 1997 Chemistry Nobelist for work on the molecular mechanism underlying the synthesis of adenosine triphosphate (ATP), the most basic energy source within living systems.

  Performance Indicator: Office of Science research has led to some of the most important discoveries of our age, including discovery of the family of quarks that make up the atomic nucleus, verifying the existence of the "Third Branch of Life" (Archaea) in 1996, and playing a key role in the development of the draft human genome in 2000.

- ***Supporting key areas of basic research***, such as materials sciences, chemistry, physics, plasma science, plant sciences, biology, advanced computation, and environmental studies, which provide the scientific understanding that underpins DOE's applied technology programs in energy, national security, and the environment. In so doing, SC also contributes to our Nation's S&T infrastructure - which is the foundation of our high technology economy. Figure 2 depicts five fields of research for which DOE is among the top five sources of Federal support. This basic research enables major advances in energy efficiency, renewable energy resources, fossil fuels, reduced environmental impacts of energy production and use, science-based stockpile stewardship, and future energy sources.

FY 2001 Federal Research Funding*

Source: NSF *** dollars in thousands**

Life Sciences	Physical Sciences	Environmental Sciences	Mathematics and Computing	Engineering
1. HHS $14,313,905	1. **Energy** $1,843,445	1. NASA $1,060,705	1. **Energy** $886,382	1. NASA $2,240,332
2. USDA $1,340,895	2. NASA $943,617	2. NSF $626,202	2. DOD $744,773	2. DOD $2,065,123
3. DOD $534,489	3. NSF $668,502	3. Interior $386,758	3. NSF $490,552	3. **Energy** $1,192,198
4. VA $283,699	4. DOD $381,272	4. Commerce $328,088	4. HHS $158,418	4. NSF $574,836
5. **Energy** $274,126	5. HHS $245,695	5. **Energy** $311,523	5. NASA $88,744	5. Transportation $395,252

Figure 2

<u>*Performance Indicator:*</u> 96% of SC's research grants are peer reviewed and competitively selected, ensuring that the best research performers are chosen and that competition for Federal research dollars results in superior science.

<u>*Performance Indicator:*</u> SC regularly conducts major reviews of the programs and projects that it manages. These reviews ensure that the quality and relevance of science sponsored by SC meets the high standards needed to ensure that DOE and national mission requirements are achieved. For example, DOE and NSF jointly charged the High Energy Physics Advisory Panel to develop a long-range plan for the Nation's High Energy Physics program and their final report, submitted in January 2002, outlines a 20-year "roadmap" for the program. Also in early 2002, the nuclear physics community completed a new *Long Range Plan for Nuclear Physics*, outlining a 10-year plan for the Nation's Nuclear Physics program, in response to a charge by DOE and NSF to the Nuclear Science Advisory Committee.

- ***Constructing and managing major scientific facilities*** that the U.S. research community depends upon for new discoveries and technological advances. These unique scientific user facilities are essential to new understanding of the nature of matter, understanding fusion plasmas, the development of new drugs, lightweight materials, and other innovations that keep the U.S. at the forefront of new technologies.

<u>*Performance Indicator:*</u> SC's construction of major research facilities historically has been on time and on budget (Figure 3).

<u>*Performance Indicator:*</u> SC's operation of major scientific facilities has ensured that a growing number of U.S. scientists have reliable access to those important facilities. The number of users at major SC user facilities is projected to grow to over 17,000 in FY 2002 and over 18,000 in FY 2003 (Figure 4). Of particular note has been the growth in users at SC's light sources. Biologists and other life scientists

have been working cooperatively with physicists and other physical scientists in multi-disciplinary teams to achieve breakthroughs in medicine, biotechnology and other fields (Figure 5).

SC Research Facility

Major Construction Projects

Completed Projects[1]	Schedule	Cost	Date Completed
Continuous Electron Beam Accel. Facility (CEBAF)	✔	✔	4th Qtr 95
Advanced Photon Source (APS)	✔	✔	4th Qtr 96
Environmental Molecular Science Laboratory (EMSL)	✔	✔	4th Qtr 97
B-Factory	✔	✔	3rd Qtr 99
Fermilab Main Injector (FMI)	✔	✔	3rd Qtr 99
Relativistic Heavy Ion Collider (RHIC)	✔	✔	4th Qtr 99
On-Going Projects			
Neutrinos at the Main Injector (NuMI)[2]	✔	✔	4th Qtr 05
Large Hadron Collider (LHC)[3]	✔	✔	4th Qtr 05
Spallation Neutron Source (SNS)	✔	✔	3rd Qtr 06

[1]All completed projects were finished within scope

[2]NuMI: SC revised the cost/schedule baseline in FY 2002. The TPC increased to $171.4M.

[3]LHC: U.S. participation includes DOE ($450M) and NSF ($81M).

Figure 3

Performance Indicator: On average, SC ensures that operational downtime does not exceed 10% of the schedule at its major scientific user facilities. Consistent operating time is vital to the Nation's scientific community because scheduling of experiments often involves long lead times and teams of scientists often have only a narrow window of opportunity to conduct their work.

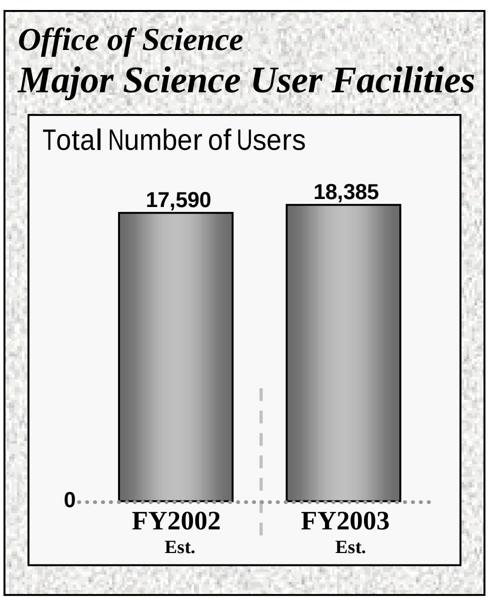

Figure 4

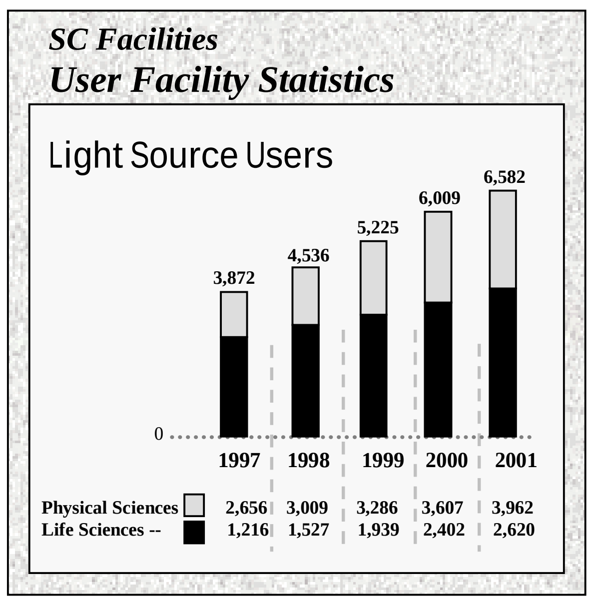

Figure 5

- ***Managing the human capital and physical resources*** that form the foundation for SC's basic research programs. SC has direct and indirect responsibility for the health and well-being of tens of thousands of national laboratory and university researchers who work at SC facilities, a highly skilled Federal workforce, and a network of national labs and facilities that have a replacement value in the multi-billions of dollars.

Major Program Activities for FY 2003

The **High Energy Physics** (HEP) program provides over 90% of the Federal support for the Nation's high energy physics research. This research seeks to understand the nature of matter and energy at the most fundamental level, as well as the basic forces that govern all processes in nature. High energy physics research requires accelerators and detectors utilizing state-of-the-art technologies in many areas including fast electronics, high speed computing, superconducting magnets, and high power radio-frequency devices. In these areas, HEP research has led to many developments with practical applications in the civilian marketplace as well as to widespread applications in other scientific disciplines. In addition, this program provides the basis for an excellent education for some of the brightest young minds in the Nation — a number of whom find employment in other scientific fields and private industry.

Until 2006, when Europe's Large Hadron Collider is scheduled to begin operations, the U.S. is the primary center for HEP research. Beginning in FY 2002, the Department's HEP program has focused its resources to take full advantage of this window of opportunity, particularly at Fermilab and the Stanford Linear Accelerator Center (SLAC). This focus continues in FY 2003. At Fermilab, following completion and successful commissioning of the Main Injector and major upgrades to the CDF and D-Zero detectors, the Tevatron Collider Run II began in March 2001. The Tevatron will be running fully in FY 2003 toward a goal of discovering the long-sought Higgs particle (thought key to understanding mass) and other important new physics.

Similarly at SLAC, there is a window of opportunity to take advantage of the outstanding performance of the B-factory to break new ground in exploring the source and nature of Charge-Parity (CP) violation in the B-meson system. For this reason, maximum running is planned for the B-factory in FY 2003. Upgrades are planned in FY 2003 for the accelerator to achieve optimal physics output and for the detector and computing capabilities to cope with high data volumes. In 2001, the BaBar detector collaboration achieved one of its physics milestones, announcing the first definitive measurement of CP violation in the B-meson system.

Although the Alternating Gradient Synchrotron (AGS) at Brookhaven is a Nuclear Physics facility, high priority HEP experimentation continued there through FY 2002. Due to a restructuring of priorities within the program, use of the AGS for HEP is terminated in FY 2003.

Support for university and laboratory based theory and experimental research, related to the high priority experiments at Fermilab and SLAC, will continue to be emphasized in FY 2003. These experimental programs are performed by university (primarily) and laboratory based scientists. These scientists construct, operate, and maintain the detectors, analyze the resulting data, and train the next generation of scientists.

Successful completion of construction and major capital equipment projects continues to be an important part of the program. Continued participation in the Large Hadron Collider (LHC) project at CERN is a high priority. The U.S. contributions to the LHC accelerator and the ATLAS and CMS detectors are making good progress and are on schedule and within budget for the current LHC scheduled start-up date of 2006. The NuMI/MINOS project, scheduled for completion in September 2005, will provide a world-class facility to study neutrino properties and make definitive measurements of neutrino mass differences.

Progress continues on two particle astrophysics experiments in partnership with NASA. The Alpha Magnetic Spectrometer (AMS) is expected to fly on Space Station Alpha in 2004, and the Large Area Telescope (LAT) mission, that is part of the Gamma-Ray Large Area Space Telescope (GLAST), is planned for 2006. Both of these experiments are expected to lead to a better understanding of dark matter, high energy gamma ray sources, and the origin of the universe.

The **Nuclear Physics** (NP) program is the major sponsor of fundamental nuclear physics research in the Nation, providing about 90% of Federal support. NP's mission is to advance our knowledge of the properties and interactions of atomic nuclei and nuclear matter in terms of the fundamental forces and particles of nature; and, develop the scientific knowledge, technologies and trained manpower that is needed to underpin DOE's missions for nuclear-related national security, energy, and environmental quality.

In FY 2003, highest priority is given to enhancing the operations of the program's user facilities, especially major new facilities that have started operations: the Relativistic Heavy Ion Collider (RHIC) and Continuous Electron Beam Accelerator Facility (CEBAF). Funding for user facility operations will increase beam hours for research by about 21% over FY 2002. High priority is also given to university researchers who use these facilities and to nuclear theory activities in support of their programs.

The new RHIC facility at Brookhaven National Laboratory (BNL) has a unique opportunity to attempt to create and characterize the quark-gluon plasma, a phase of matter thought to have existed in the very early stage of the universe. Experimental data taken between FY 2000-2002 have already revealed unexpected behaviors and show aspects of possible plasma formation. RHIC achieved its planned full collision rate in FY 2002 and in FY 2003 the running schedule will be doubled, providing the opportunity to explore this exciting new physics in depth.

At the Thomas Jefferson National Accelerator Laboratory's CEBAF facility intense, polarized electron beams are being used to gain knowledge and insights on how quarks and gluons bind together to make protons and neutrons. In FY 2003, funding will support an aggressive experimental program with the newly completed G0 detector, to map out the strange quark contribution to the structure of the nucleon.

The unique research program studying the structure of the nucleon at the MIT/Bates facility with the BLAST detector, now being commissioned, will be initiated in FY 2003. Nuclear structure and astrophysics studies will be pursued at the three low-energy user facilities (ATLAS/ANL, 88-Inch Cyclotron/LBNL and HRIBF/ORNL) with increased running schedules compared to FY 2002.

A highlight of FY 2001 for the NP program was the reported measurements from the Sudbury Neutrino Observatory (SNO), providing an answer to a 30-year-old mystery – the puzzle of why there are less solar neutrinos detected than are expected. NP researchers found that the answer lies not with the Sun, but with the neutrinos that change their type (oscillate) as they travel from the core of the Sun to the Earth. In FY 2002-2005, SNO will make unique and more sensitive measurements of the flux and spectra of solar neutrinos. Neutrino oscillations are evidence that neutrinos have mass, an observation that forces a re-evaluation of the existing Standard Model of particle physics.

The **Biological and Environmental Research** (BER) program, in coordination with other Federal agencies and with guidance from the BER Advisory Committee, supports basic, peer-reviewed research at national laboratories and universities across a remarkable breadth of scientific fields ranging from global change to environmental remediation to genomics, proteomics, and medicine. The 21st century has been called the “biological century” because advances in biology are expected to have an enormous impact on health, environment and our ability to predict climate change over decades and centuries. In FY 2003, the BER program will contribute to these advances through basic research in support of DOE missions.

Life sciences activities offer revolutionary advances for clean energy, mitigation of greenhouse gases, environmental cleanup, and detection and defeat of bioterrorism. Structural biology activities support facilities for scientists at synchrotron and neutron sources. A new station for small angle neutron scattering has been completed at Oak Ridge National Laboratory (ORNL), providing U.S. scientists with a much needed world-class facility**.** Genomes to Life activities develop novel research and computational tools that, together with capabilities in genomics, structural biology, and imaging will lead to an understanding of and predictive capabilities for complex biological systems. Human Genome research continues to develop advanced sequencing technologies needed by research and clinical scientists and provides high throughput DNA sequencing resources to address sequencing needs across the federal government, including biothreat reduction. Low Dose Radiation research will underpin a new scientific basis for determining the health risks from low dose ionizing radiation. The Laboratory for Comparative and Functional Genomics at ORNL will begin operations in FY 2003.

Climate Change Research underpins the Administration’s Climate Change Research Initiative (CCRI). Climate modeling research will improve regional and global scale simulations and predictions of climate. FY 2003 will see the development of an improved climate model with twice the spatial resolution of the previous version. Atmospheric Radiation Measurement research seeks to understand the role of clouds and solar radiation for use in climate models and to understand the water cycle to better predict precipitation patterns. Carbon and ecosystem research will underpin the CCRI objective to quantify the North American carbon cycle and to understand the effects of elevated carbon dioxide on terrestrial ecosystems.

The **Basic Energy Sciences** (BES) program is a principal sponsor of fundamental research for the Nation in the areas of materials sciences and engineering, chemistry, geosciences, and bioscience as it relates to energy. This research underpins DOE missions in energy, environment, and national security; advances energy related basic science on a broad front; and provides unique user facilities for the U.S. scientific community.

In FY 2003, BES will expand research in selected areas of nanoscale science, engineering, and technology (NSET) research and will continue design and begin construction for Nanoscale Science Research Centers (NSRCs). Fundamental research to understand the properties of materials at the nanoscale will be increased in three areas: synthesis and processing of materials at the nanoscale, condensed matter physics, and catalysis. The response of the scientific community to the NSET initiative has been strong.

Funds are requested in FY 2003 to start construction of the NSRC located at ORNL; and for continued engineering and design of a NSRC located at Lawrence Berkeley National Laboratory, and a NSRC with facilities at or collocated at Sandia National Laboratories (Albuquerque) and Los Alamos National Laboratory. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale, and they will serve the Nation’s researchers broadly. These NSRCs were chosen from among those proposed through a peer review process.

A high priority in FY 2003 is continued construction of the Spallation Neutron Source (SNS) to provide the next-generation, short-pulse spallation neutron source for neutron scattering. The project, which is to be completed in June 2006, is on schedule and within budget with over one-third of the work completed as of the end of October 2001. At the end of FY 2003, construction of the SNS will be 61% complete.

The mission of the **Advanced Scientific Computing Research** (ASCR) program is to foster and support fundamental research in advanced scientific computing (applied mathematics, computer science, and networking) and to provide the high performance computational and networking tools that enable DOE to succeed in its science, energy, environmental quality, and national security missions. These tools are crucial if DOE researchers in the scientific disciplines are to maintain their world leadership.

In FY 2003, the ASCR program will continue to build on its leadership in high performance computing and networks by supporting the "Scientific Discovery through Advanced Computing" (SciDAC) program, and initiating new partnerships with the scientific disciplines in the Office of Science. SciDAC is a collaborative program across the Office of Science to produce the scientific computing, networking and collaboration tools that DOE researchers will require to address the scientific challenges of the next decade. This program was described in the March 2000 report to Congress entitled, "Scientific Discovery through Advanced Computing."

The SciDAC research portfolio will achieve several milestones in FY 2003. The Integrated Software Infrastructure Centers (ISICs) will complete design work and will deliver initial implementation of the software infrastructure on which the applications will rely for optimal performance and scalability on terascale platforms. The Applied Mathematics ISICs will deploy a suite of robust and scalable software solvers. The Computer Science ISICs will deploy software for high-throughput access to terascale datasets, and will deploy a collection of software tools for managing and monitoring large collections of distributed computing resources.

The **Fusion Energy Sciences** (FES) program leads the national research effort to advance plasma science, fusion science, and fusion technology—the knowledge base needed for an economically and environmentally attractive fusion energy source. The science and technology of fusion have progressed to the point that the next major research step is the exploration of the physics of a self-sustained plasma reaction in a burning plasma physics experiment. SC will fund research that supports such an experiment. In addition, SC will fund the exploration of innovative approaches to confining, heating, and fueling plasmas.

FES has two major thrusts in FY 2003. One is to begin the engineering design and fabrication of the National Compact Stellarator Experiment to be located at PPPL. It will provide scientists with a unique facility for studying the physics of this configuration related to, but with advantages relative to, the tokamak. The other is to enhance the operation of the three major fusion experiments by extending the operating weeks on each of them to 21 weeks in FY 2003.

Research funded by the FES program in FY 2001 produced results over a wide range of activities. Examples include: dramatic improvements in the feedback modification of plasma instabilities on the DIII-D experiment that doubled previous limits on plasma pressure; and the development, by researchers at the Alcator C-Mod, of a technique known as "off-axis ion cyclotron radio frequency heating" that can reduce energy transport. Greatly reduced energy transport has also been achieved in the Reversed Field Pinch (RFP), an innovative confinement concept experiment at the University of Wisconsin. Plasma turbulence simulation was improved through the development of new codes.

Science Program Direction (SCPD) enables a skilled, highly motivated Federal workforce to manage SC's basic and applied research portfolio, programs, projects, and facilities in support of new and improved energy, environmental, and health technologies, and educational opportunities. SCPD consists of three subprograms: Program Direction, Science Education, and Field Operations. The Program Direction subprogram supports Federal staff responsible for directing, administering, and supporting the broad spectrum of scientific disciplines. The Science Education subprogram supports four educational human resource development programs that train students to enter careers in science, mathematics, engineering, and technology. The Field Operations subprogram is the funding source for the Federal workforce in the Field responsible for management and administrative functions performed within the Chicago and Oak Ridge Operations Offices, and site offices supporting SC laboratories and facilities.

In FY 2002, SC initiated a reengineering effort throughout its headquarters and field organizations focused on increasing managerial flexibility, authority and accountability to reduce or avoid costs. This bottoms-up approach, across the SC complex, will form the basis for identifying SC's current or projected skills mix problems and how to address them. The SC reengineering effort will allow decision-making based on sound management principles to reduce administrative costs in field/laboratory operations and increase the span of control by FY 2003. The size of the field workforce will be reduced consistent with implementing positive organizational changes as a result of the studies underway.

In addition, SC will manage its Federal human capital to effectively respond to the science needs of the future and to the pending "brain-drain" that will be created by the fact that over 50% of SC's senior scientists will be retirement eligible within the next three years. Emphasis will be placed on obtaining additional human resources to support evolving research programs in several complex areas including nanoscale science, X-ray and neutron scattering, "Scientific Discovery through Advanced Computing", Global Climate Change, and "Genomes to Life." Preserving the intellectual capital and institutional knowledge vested in SC's senior Federal scientists and program managers is a high priority and will be a challenging task over the next five years. This is a dilemma faced by many agencies, but it is particularly acute and problematic for SC given the specialized scientific and programmatic knowledge, and technical qualifications required from potential replacements.

In support of these efforts to gain efficiencies through management improvements, SC is dedicating $5,500,000 to continue supporting a DOE-wide information technology project, the Corporate R&D Portfolio Management Environment (PME). Staff supporting PME are working with all of the Department's major R&D programs and other information technology projects to develop an integrated, end-to-end "corporate" electronic R&D management infrastructure that will enable cradle-to-grave tracking of projects and inter- and intra-program R&D portfolio management. This capability will foster R&D collaboration and support departmental responses to inquiries made by Congress, the Office of Management and Budget, and the Office of Science and Technology Policy using near-real-time data, in effect reducing overhead. PME is currently developing the first of three modules that will include application tool-sets that may be used for processing of proposals electronically.

The **Safeguards and Security** (S&S) program ensures appropriate levels of protection against unauthorized access, theft, diversion, loss of custody, or destruction of DOE assets and hostile acts that may cause adverse impacts on fundamental science, national security or the health and safety of DOE and contractor employees, the public or the environment. SC's Integrated Safeguards and Security Management strategy encompasses a tailored approach to safeguards and security. As such, each site has a tailored protection program that is analyzed and defined in their individual Security Plan. This approach allows each site to design varying degrees of protection commensurate with the risks and consequences described in their site-specific threat scenarios.

The FY 2003 request meets minimum, essential security requirements. Protection of employees and visitors is of primary concern, as well as protection of special nuclear material and research facilities, equipment and data. As such, priority attention is given to protective forces, physical security systems, and cyber security.

The mission of the **Science Laboratories Infrastructure** (SLI) program is to enable the conduct of Departmental research missions at SC laboratories by funding line item construction projects to maintain the general purpose infrastructure (GPI) and the clean up and removal of excess facilities. The program also supports SC landlord responsibilities for the 36,000 acre Oak Ridge Reservation and provides Payments in Lieu of Taxes (PILT) to local communities around ANL-E, BNL, and ORNL.

In FY 2003, the SLI program has been broadened to include all SC laboratories, both single purpose and multiprogram. A new subprogram, Excess Facilities Disposition, has been added to address the disposal of excess facilities at SC laboratories. Funding for FY 2003 is $5,055,000 and will eliminate or clean up 176,000 square feet of excess space. The new Facilities and Infrastructure (F&I) program funded by Congress at $10,000,000 in FY 2002, is being used to eliminate or clean up about 400,000 square feet of excess space. This F&I program was merged with the former Multiprogram Energy Laboratories – Facilities Support (MEL-FS) program to form the expanded SLI program in the FY 2003 request.

Construction funding for FY 2003 will increase by $9,800,000 over FY 2002 - reflecting the need to modernize SC laboratories. Three new construction starts are planned for FY 2003 including two buildings that will replace 71,000 square feet of space that cannot be economically renovated to support modern research.

The **Technical Information Management** (TIM) program, managed by the Office of Scientific and Technical Information (OSTI), in the Office of Science, provides electronic access to worldwide energy scientific and technical information to DOE researchers, U.S. industry, academia, and U.S. citizens. This is accomplished through a set of Internet-based information products for technical reports, scientific journals, and preprints – the three main sources in which scientific and technical information is recorded. In addition, the TIM program produces an inventory of R&D projects in progress across the Department.

In FY 2003, the TIM program will continue to lead DOE e-government initiatives for disseminating information, which include building the world's most comprehensive collection of physical sciences information and providing improved electronic access to full-text gray literature (literature not commercially available), journal literature, and preprints through partnerships with academia and the commercial sector.

The TIM program accomplishments for FY 2001 include expanded and increased access to published and pre-printed scientific and technical information via cost-effective information retrieval systems, resulting in a 25% increase in users served; completion of the DOE goal to transition to electronic scientific and technical reporting; taking a leadership role in the development of *science.gov*, the Interagency FirstGov for Science web resource; and launching the Energy Citations Database, a new web-based information product containing over 2,000,000 bibliographic records for energy and energy-related scientific and technical information from DOE and its predecessor agencies.

Science Strategic Objectives for FY 2003

This budget will support the Department of Energy's Science Goal:

Deliver the scientific knowledge and discoveries for DOE's applied missions; advance the frontiers of the physical sciences and areas of biological, environmental and computational sciences; and provide world-class research facilities and essential scientific human capital to the Nation's overall science enterprise.

For FY 2003, the Office of Science has established eight Strategic Objectives, with related Program Strategic Performance Goals (PSPGs) and Targets that will contribute to the Department of Energy's mission objectives in national defense, energy security, environmental quality, and science stewardship. The Performance Standards that will be used to evaluate the PSPGs and their Targets are described in Figure 6.

Performance Standards:	**Blue:**	Significantly exceeds expectations
	Green:	Meets all established targets/milestones
	Yellow:	Meets all critical targets/milestones
	Red:	Below expectation

Figure 6

The SC Strategic Objectives (**SC1** through **SC8**) and PSPGs (**SC1-1** through **SC7-6**) are:

SC1: Determine whether the Standard Model accurately predicts the mechanism that breaks the symmetry between natural forces and generates mass for all fundamental particles by 2010 or whether an alternate theory is required, and on the same timescale determine whether the absence of antimatter in the universe can be explained by known physics phenomena.

SC1-1: Exploit U.S. leadership at the energy frontier by conducting an experimental research program that will establish the foundations for a new understanding of the physical universe. (HEP Research and Technology subprogram and HEP Facilities subprogram)

SC1-2: Explain the observed absence of antimatter in the universe through understanding of the phenomenon of CP Violation. (HEP Research and Technology subprogram and HEP Facilities subprogram)

SC2: By 2015, describe the properties of the nucleon and light nuclei in terms of the properties and interactions of the underlying quarks and gluons; by 2010, establish whether a quark-gluon plasma can be created in the laboratory and, if so, characterize its properties; by 2020, characterize the structure and reactions of nuclei at the limits of stability and develop the theoretical models to describe their properties, and characterize, using experiments in the laboratory, the nuclear processes within stars and supernovae that are needed to provide an understanding of nucleosynthesis.

SC2-1: Determine the structure of nucleons in terms of bound states of quarks and gluons. Measure the effects of this structure on the properties of atomic nuclei. (NP subprograms in Medium Energy Nuclear Physics and Nuclear Theory)

SC2-2: Determine the behavior and properties of hot, dense nuclear matter as a function of temperature and density. Discover and characterize the quark-gluon plasma. (NP subprograms in Heavy Ion Nuclear Physics and Nuclear Theory)

SC2-3: Determine the low energy properties of nuclei, particularly at their limits of stability. Use these properties to understand energy generation and the origin of the elements in stars, and the fundamental symmetries of the "Standard Model" of elementary particle physics. (NP subprograms in Low Energy Nuclear Physics and Nuclear Theory)

SC3: By 2010, develop the basis for biotechnology solutions for clean energy, carbon sequestration, environmental cleanup, and bioterrorism detection and defeat by characterizing the multiprotein complexes that carry out biology in cells and by determining how microbial communities work as a system; and determine the sensitivity of climate to different levels of greenhouse gases and aerosols in the atmosphere and the potential resulting consequences of climate change associated with these levels by resolving or reducing key uncertainties in model predictions of both climate changes that would result from each level and the associated consequences.

SC3-1: Determine, compare, and analyze DNA sequences of microbes and other organisms that will underpin development of biotechnology solutions for clean energy, carbon sequestration, environmental cleanup, and bioterrorism detection and defeat. (BER subprograms in Life Sciences, Environmental Remediation, and Medical Applications and Measurement Science)

SC3-2: Establish the scientific foundation for determining a safe level of greenhouse gases and aerosols in the atmosphere by resolving or reducing key uncertainties in predicting their effects on climate, and provide the foundation to predict, assess and mitigate potential adverse effects of energy production and use on the environment. (BER Climate Change Research subprogram)

SC4: Provide leading scientific research programs in materials sciences and engineering, chemical sciences, biosciences, and geosciences that underpin DOE missions and spur major advances in national security, environmental quality, and the production of safe, secure, efficient, and environmentally responsible systems of energy supply; as part of these programs, by 2010, establish a suite of Nanoscale Science Research Centers and a robust nanoscience research program, allowing the atom-by-atom design of revolutionary new materials for DOE mission applications; and restore U.S. preeminence in neutron scattering research and facilities.

SC4-1: Build leading research programs in the scientific disciplines encompassed by the BES mission areas and provide world-class, peer-reviewed research results cognizant of DOE needs as well as the needs of the broad scientific community. (BES Materials Sciences and Engineering subprogram and BES Chemical Sciences, Geosciences, and Energy Biosciences subprogram)

SC4-2: Enable U.S. leadership in nanoscale science, allowing the atom-by-atom design of materials and integrated systems of nanostructured components having new and improved properties for applications as diverse as high-efficiency solar cells and better catalysts for the production of fuels. (BES Materials Sciences and Engineering subprogram and BES Chemical Sciences, Geosciences, and Energy Biosciences subprogram and the Advanced Scientific Computing Mathematical, Information and Computational Sciences subprogram)

SC4-3: Develop advanced research instruments for x-ray diffraction, scattering, and imaging to provide diverse communities of researchers with the tools necessary for exploration and discovery in materials sciences and engineering, chemistry, earth and geosciences, and biology. (BES Materials Sciences and Engineering subprogram and BES Chemical Sciences, Geosciences, and Energy Biosciences subprogram)

SC5: Enable advances and discoveries in DOE science through world-class research in the distributed operation of high performance, scientific computing and network facilities; and to deliver, in 2006, a suite of specialized software tools for DOE scientific simulations that take full advantage of terascale computers and high speed networks.

SC5-1: Build leading research programs in focused disciplines of applied mathematics, computer science, and network and collaboratory research important to national and energy security to spur revolutionary advances in the use of high performance computers and networks. (ASCR Mathematical, Information and Computational Sciences subprogram)

SC5-2: Create the *Mathematical and Computing Systems Software* and the *High Performance Computing Facilities* that enable Scientific Simulation and Modeling Codes to take full advantage of the extraordinary capabilities of terascale computers, and the *Collaboratory Software Infrastructure* to enable geographically-separated scientists to effectively work together as a team as well as provide electronic access to both facilities and data. (ASCR Mathematical, Information and Computational Sciences subprogram)

SC6: Advance the fundamental understanding of plasma, the fourth state of matter**,** and enhance predictive capabilities, through the comparison of well-diagnosed experiments, theory and simulation; for MFE, resolve outstanding scientific issues and establish reduced-cost paths to more attractive fusion energy systems by investigating a broad range of innovative magnetic confinement configurations; advance understanding and innovation in high-performance plasmas, optimizing for projected power-plant requirements; develop enabling technologies to advance fusion science, pursue innovative technologies and materials to improve the vision for fusion energy; and apply systems analysis to optimize fusion development; for IFE, leveraging from the ICF program sponsored by the National Nuclear Security Agency’s Office of Defense Programs, advance the fundamental understanding and predictability of high energy density plasmas for IFE.

SC6-1: Develop the basis for a reliable capability to predict the behavior of magnetically confined plasma in a broad range of plasma confinement configurations and use the advances in the Tokamak concept to enable the start of the burning plasma physics phase of the U.S. fusion sciences program. (FES Science subprogram)

SC6-2: Develop the cutting edge technologies that enable FES research facilities to achieve their scientific goals, as well as allow the U.S. to access facility capabilities not available domestically, and investigate innovations needed to create attractive visions of design and technologies for fusion energy systems. (FES Enabling R&D subprogram)

SC7: Provide major advanced scientific user facilities where scientific excellence is validated by external review; average operational downtime does not exceed 10% of schedule; construction and upgrades are within 10% of schedule and budget; and facility technology research and development programs meet their goals. (Crosscutting all major programs)

SC7-1A: Manage HEP facility operations to the highest standards of performance, using merit evaluation with independent peer review. Meet U.S. commitments to the accelerator and detector components of the Large Hadron Collider (LHC) facility now under construction. (HEP Facilities subprogram)

SC7-1B: Perform the research and development needed to support the operation and upgrade of existing HEP facilities and to provide the tools and technology to develop new forefront facilities. (HEP Research and Technology subprogram)

SC7-2: Manage all NP facility operations and construction to the highest standards of overall performance, using merit evaluation with independent peer review. (NP subprograms in: Medium Energy Nuclear Physics, Heavy Ion Nuclear Physics, and Low Energy Nuclear Physics)

SC7-3: Manage all BER facility operations and construction to the highest standards of overall performance, using merit evaluation with independent peer review. (BER subprograms in: Life Sciences, Climate Change Research, Environmental Remediation, Medical Applications and Measurement Science)

SC7-4A: Manage BES facility operations and construction to the highest standards of overall performance using merit evaluation with independent peer review. (BES Materials Sciences and Engineering subprogram and BES Chemical Sciences, Geosciences, and Energy Biosciences subprogram)

SC7-4B: Restore U.S. preeminence in neutron scattering research, instrumentation, and facilities to provide researchers with the tools necessary for the exploration and discovery of advanced materials. (BES Materials Sciences and Engineering subprogram and BES Chemical Sciences, Geosciences, and Energy Biosciences subprogram)

SC7-5: Provide advanced computational scientific user facilities where scientific excellence is validated by external review; average operational downtime does not exceed 10% of schedule; construction and upgrades are within 10% of schedule and budget; and facility technology research and development programs meet their goals. (ASCR Mathematical, Information and Computational Sciences subprogram)

SC7-6: Manage all FES facility operations and construction to the highest standards of overall performance, using merit evaluation and independent peer review. (FES Facility Operations subprogram)

SC8: Ensure efficient SC program management of research and construction projects through a re-engineering effort of SC processes by FY 2003 that will support world-class science through systematic improvements in SC's laboratory physical infrastructure, security, and ES&H. (Covers the following accounts: Energy Research Analysis, Science Laboratories Infrastructure, Science Program Direction, Science Education, Field Operations, Safeguards and Security, Technical Information) Note: This Strategic Objective is supported by Program Strategic Performance Goals described within the detailed budget justification for each account.

Dr. James Decker
Director (Acting)
Office of Science

Table 1

OFFICE OF SCIENCE
FY 2003 PRESIDENT'S BUDGET REQUEST TO CONGRESS
(B/A in thousands of dollars)

	FY 2001 Comparable Approp.	FY 2002 Comparable Approp.	FY 2003 Pres. Request
Science			
Basic Energy Sciences	973,768	999,605	1,019,600
Advanced Scientific and Computing Research	161,296	157,400	169,625
Biological and Environmental Research	514,064	570,300	504,215
Fusion Energy Sciences	241,957	247,480	257,310
High Energy Physics	695,927	713,170	724,990
Nuclear Physics	351,794	359,035	382,370
Energy Research Analyses	950	995	1,020
Science Laboratories Infrastructure	26,887	37,130	42,735
Science Program Direction	139,861	152,475	139,479
Small Business Innovation Research and Small Business Technology Transfer	93,069	-	-
Subtotal	3,199,573	3,237,590	3,241,344
Safeguards and Security			
Safeguards and Security	39,081	47,609	48,127
Reimbursable Work	(4,648)	(4,460)	(4,383)
Total, Safeguards and Security	34,433	43,149	43,744
Total	3,234,006	3,280,739	3,285,088
Energy Supply			
Technical Information Management	9,204	8,049	8,353
Total	9,204	8,049	8,353

Table 2

OFFICE OF SCIENCE
FY 2003 PRESIDENT'S BUDGET REQUEST TO CONGRESS
(B/A in thousands of dollars)

	FY 2001 Comparable Approp.	FY 2002 Comparable Approp.	FY 2003 Pres. Request
Global Climate Change Research	115,624	120,168	126,169
High Performance Computing and Communications	171,471	174,449	185,704
Genomes to Life	3,000	24,514	44,542
Nanoscience Engineering and Technology	81,974	85,264	133,040

Table 3

OFFICE OF SCIENCE
FY 2003 PRESIDENT'S BUDGET REQUEST TO CONGRESS
(B/A in thousands of dollars)

Major Site Funding	FY 2001 Comparable Approp.	FY 2002 Comparable Approp.	FY 2003 Pres. Request
AMES LABORATORY			
Advanced Scientific and Computing Research	2,151	1,991	1,625
Basic Energy Sciences	17,961	16,114	16,507
Biological and Environmental Research	1,066	690	512
Safeguards and Security	264	397	409
Total Laboratory	21,442	19,192	19,053
ARGONNE NATIONAL LABORATORY			
Advanced Scientific and Computing Research	14,077	11,246	8,573
Basic Energy Sciences	159,028	154,389	152,734
Biological and Environmental Research	27,521	23,067	22,595
Fusion Energy Sciences	2,404	1,661	1,522
High Energy Physics	9,887	8,762	10,293
Nuclear Physics	17,912	16,532	17,548
Safeguards and Security	5,139	7,679	7,809
Science Laboratories Infrastructure	6,611	3,643	4,205
Science Program Direction	430	430	615
Total Laboratory	243,009	227,409	225,894
BROOKHAVEN NATIONAL LABORATORY			
Advanced Scientific and Computing Research	2,130	1,199	542
Basic Energy Sciences	75,942	56,606	57,398
Biological and Environmental Research	23,549	18,862	15,993
High Energy Physics	38,437	30,432	23,319
Nuclear Physics	140,791	138,671	149,004
Safeguards and Security	9,428	10,916	10,970
Science Laboratories Infrastructure	6,444	7,413	8,513
Science Program Direction	420	430	615
Total Laboratory	297,141	264,529	266,354

	FY 2000 Comparable Approp.	FY 2001 Comparable Approp.	FY 2002 Pres. Request
FERMI NATIONAL ACCELERATOR LABORATORY			
Advanced Scientific and Computing Research	120	226	60
Energy Research Analyses	22	-	-
High Energy Physics	306,567	304,791	313,340
Nuclear Physics	50	-	-
Safeguards and Security	2,430	2,763	2,837
Science Program Direction	50	20	100
Total Laboratory	309,239	307,800	316,337
IDAHO NATIONAL ENGINEERING LABORATORY			
Basic Energy Sciences	2,660	1,756	1,494
Biological and Environmental Research	1,440	1,056	400
Fusion Energy Sciences	2,210	2,326	2,392
Science Program Direction	40	10	-
Total Laboratory	6,350	5,148	4,286
LAWRENCE BERKELEY NATIONAL LABORATORY			
Advanced Scientific and Computing Research	65,807	51,325	53,223
Basic Energy Sciences	77,896	74,149	78,691
Biological and Environmental Research	61,970	50,133	44,821
Energy Research Analyses	50	-	50
Fusion Energy Sciences	5,510	5,861	5,799
High Energy Physics	40,694	37,817	32,530
Nuclear Physics	18,703	17,689	18,615
Safeguards and Security	3,492	4,706	4,753
Science Laboratories Infrastructure	2,113	7,400	5,607
Science Program Direction	445	480	750
Total Laboratory	276,680	249,560	244,839
LAWRENCE LIVERMORE NATIONAL LABORATORY			
Advanced Scientific and Computing Research	4,898	6,587	3,068
Basic Energy Sciences	5,643	4,793	4,676
Biological and Environmental Research	33,450	32,715	36,899
Fusion Energy Sciences	14,586	14,255	14,411
High Energy Physics	1,556	441	429
Nuclear Physics	755	614	507
Science Laboratories Infrastructure	-	350	250
Total Laboratory	60,888	59,755	60,240

	FY 2000 Comparable Approp.	FY 2001 Comparable Approp.	FY 2002 Pres. Request
LOS ALAMOS NATIONAL LABORATORY			
Advanced Scientific and Computing Research	5,727	2,855	5,020
Basic Energy Sciences	24,205	22,738	23,041
Biological and Environmental Research	22,447	19,848	18,681
Fusion Energy Sciences	7,258	7,378	7,308
High Energy Physics	1,075	869	825
Nuclear Physics	10,378	9,643	9,123
Science Program Direction	2,234	3,135	3,970
Total Laboratory	73,324	66,466	67,968
NATIONAL RENEWABLE ENERGY LABORATORY			
Basic Energy Sciences	5,876	5,247	4,562
Science Program Direction	-	-	150
Total Laboratory	5,876	5,247	4,712
OAK RIDGE NATIONAL LABORATORY			
Advanced Scientific and Computing Research	22,545	11,251	10,496
Basic Energy Sciences	374,386	391,333	343,176
Biological and Environmental Research	43,303	33,729	33,085
Fusion Energy Sciences	19,519	29,289	19,258
High Energy Physics	790	663	660
Nuclear Physics	15,879	15,307	16,870
Safeguards and Security	4,939	7,882	7,913
Science Laboratories Infrastructure	13,254	18,365	22,832
Total Laboratory	494,615	507,819	454,290
PACIFIC NORTHWEST NATIONAL LABORATORY			
Advanced Scientific and Computing Research	4,616	3,738	1,003
Basic Energy Sciences	13,024	11,346	11,648
Biological and Environmental Research	72,618	73,383	73,052
Energy Research Analyses	401	254	465
Fusion Energy Sciences	1,427	1,328	1,556
Science Laboratories Infrastructure	-	1,377	4,000
Science Program Direction	185	555	740
Total Laboratory	92,271	91,981	92,464

	FY 2000 Comparable Approp.	FY 2001 Comparable Approp.	FY 2002 Pres. Request
PRINCETON PLASMA PHYSICS LABORATORY			
Advanced Scientific and Computing Research	190	340	-
Basic Energy Sciences			
Fusion Energy Sciences	70,649	68,794	63,576
High Energy Physics	394	310	364
Safeguards and Security	1,735	1,828	1,855
Science Laboratories Infrastructure	-	875	545
Science Program Direction	110	125	100
Total Laboratory	73,078	72,272	66,440
SANDIA NATIONAL LABORATORY			
Advanced Scientific and Computing Research	4,656	4,767	3,889
Basic Energy Sciences	24,673	23,349	25,987
Biological and Environmental Research	3,474	3,391	2,737
Energy Research Analyses	200	5	100
Fusion Energy Sciences	3,178	2,992	3,213
High Energy Physics	4	-	-
Nuclear Physics	4	-	-
Total Laboratory	36,189	34,504	35,926
STANFORD LINEAR ACCELERATOR CENTER			
Advanced Scientific and Computing Research	315	502	234
Basic Energy Sciences	34,691	31,643	41,716
Biological and Environmental Research	3,656	4,170	5,550
High Energy Physics	159,503	164,545	163,887
Safeguards and Security	1,814	2,150	2,207
Science Laboratories Infrastructure	-	400	-
Science Program Direction	125	150	150
Total Laboratory	200,104	203,560	213,744
THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY			
Advanced Scientific and Computing Research	50	-	-
Biological and Environmental Research	155	400	500
High Energy Physics	5	-	-
Nuclear Physics	74,135	73,830	79,138
Safeguards and Security	552	947	972
Science Laboratories Infrastructure	-	-	1,500
Science Program Direction	45	50	100
Total Laboratory	74,942	75,227	82,210

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 **[**25**]** *28* passenger motor vehicles for replacement only, **[**$3,233,100,000**]** *$3,285,088,000*, to remain available until expended. *(Energy and Water Development Appropriations Act, 2002; additional authorizing legislation required.)*