DOE ENERGY PROGRAMS FY 2008

Federal Funds

Office of Science Science

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.

Note.--A regular 2007 appropriation for this account had not been enacted at the time the budget was prepared; therefore, this account is operating under a continuing resolution (P.L. 109-289, Division B, as amended). The amounts included for 2007 in this budget reflect the levels provided by the continuing resolution.

Program and Financing (in millions of dollars)

Identification code 89-0222-0-1-251	2006 actual	2007 est.	2008 est.
Obligations by program activity:			
00.01 High energy physics.....	701	733	782
00.03 Nuclear physics.....	358	397	471
00.05 Biological and environmental research.	564	473	532
00.06 Basic energy sciences.....	1,113	1,199	1,499
00.07 Advanced scientific computing research.	228	236	340
00.09 Science laboratory infrastructure.	42	43	79
00.11 Program direction.....	161	164	185
00.14 **Fusion** energy sciences.....	282	306	428
00.15 Safeguard and securities.....	68	68	71
00.17 Workforce dev. for teachers & scientists...	7	7	11
00.18 Small business innovation research	104		
00.19 Small business technology transfer	13		
10.00 Total new obligations.....	3,641	3,626	4,398
Budgetary resources available for obligation:			
21.40 Unobligated balance carried forward,	28	21	
22.00 New budget authority (gross).....	3,633	3,605	4,398
22.10 Resources available from prior year.	1		
23.90 Total budgetary resources available	3,662	3,626	4,398

23.95 Total new obligations.....	-3,641	-3,626	-4,398
24.40 Unobligated balance carried forward,	21		
New budget authority (gross), detail: Discretionary:			
40.00 Appropriation.....	3,634	3,605	4,398
40.35 Appropriation permanently reduced...	-36		
42.00 Transferred from other accounts.	35		
43.00 Appropriation (total discretionary).	3,633	3,605	4,398
Change in obligated balances:			
72.40 Obligated balance, start of year..	2,194	2,232	2,241
73.10 Total new obligations.....	3,641	3,626	4,398
73.20 Total outlays (gross).....	-3,602	-3,617	-4,067
73.45 Recoveries of prior year obligations.	-1		
74.40 Obligated balance, end of year..	2,232	2,241	2,572
Outlays (gross), detail:			
86.90 Outlays from new discretionary authority...	2,136	2,090	2,551
86.93 Outlays from discretionary balances	1,466	1,527	1,516
87.00 Total outlays (gross).....	3,602	3,617	4,067
Net budget authority and outlays:			
89.00 Budget authority.....	3,633	3,605	4,398
90.00 Outlays.....	3,602	3,617	4,067

High energy physics.--The high energy physics (HEP) research program focuses on gaining insights into the fundamental constituents of matter, the fundamental forces in nature, and the mysterious forms of unseen energy and matter that dominate the universe. The program encompasses both experimental and theoretical particle physics research and related advanced accelerator and detector technology research [[Page 360]] and development (R&D). The primary mode of experimental research involves the study of collisions of energetic particles using large particle accelerators or colliding beam facilities.

In addition to contributing to breakthrough discoveries such as the existence of the invisible ``dark energy'' that permeates empty space, state-of-the-art technology

developed for accelerators and detectors contributes to progress in fields such as fast electronics, high-speed computing, superconducting magnet technology, and high-power radio frequency devices. HEP research also continues to make major contributions to accelerator technology and provides the expertise necessary for the expansion of such technology into fields such as medical imaging and diagnostics, and materials, biology, and chemistry research using light sources.

The HEP budget request will support the continued operation of the Department's major HEP facilities: the Fermilab Tevatron Collider and Neutrinos at the Main Injector (NuMI) and the Stanford Linear Accelerator Center B-Factory. In addition, funding is provided for the Large Hadron Collider research program for commissioning, maintenance, supplied components, and software and computing infrastructure for data analysis as the Large Hadron Collider begins operations in 2008.

The HEP request also develops the most compelling new scientific opportunities for the U.S. HEP program in the next decade, including $60 million of R&D for a potential international linear collider, enabling a U.S. leadership role in a comprehensive, coordinated international R&D program. While the future trajectory of the HEP program has a strong emphasis on linear collider R&D, it will also provide a diverse array of other world-leading efforts, including the understanding of dark energy, strong U.S. participation in Large Hadron Collider physics, and forefront neutrino experiments and facilities. Accelerator technology R&D will be increasingly focused on superconducting radio frequency structures in view of their potentially wide applicability to many scientific disciplines.

Nuclear physics.--The goal of the nuclear physics program is to 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. The program aims to provide a compelling story of how the world around us has evolved, and focuses on such questions as--``What is the structure of the nucleon?''; ``What is the structure of nucleonic matter?''; ``What are the properties of hot nuclear matter?''; ``What is the nuclear microphysics of the universe?''; and ``What is to be the new Standard Model?''

Fundamental research in nuclear physics will provide new insights and advance the world's knowledge on the nature of matter and energy and develop the scientific knowledge, technologies, and trained manpower that are needed to underpin DOE's missions for nuclear-related national security, energy, and environmental quality.

The Relativistic Heavy Ion Collider research program at Brookhaven National Laboratory will continue pursuing the characterization of new states of matter formed at high energies and densities.

The Thomas Jefferson National Accelerator Facility/Continuous Electron Beam Accelerator Facility (CEBAF) experimental program will continue its studies focused on

understanding the substructure of the nucleon. The doubling of the electron beam energy at CEBAF to 12 giga-electron volts (GeV) opens the opportunity for new discoveries and an understanding of quark confinement--one of the mysteries of modern physics. Research, development, and design for the upgrade continue in 2008. Operations of the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory and the Argonne Tandem Linear Accelerator System at Argonne National Laboratory will be supported for the study of nuclear structure and nuclear astrophysics, as will the operation of accelerator laboratories at universities.

Biological and environmental research.--This program develops the knowledge base necessary to identify, understand, and anticipate the long-term health and environmental consequences of energy use and development and utilizes the Department's unique scientific and technological capabilities to solve major scientific problems in the environment, medicine, and biology. Planned activities include programs in global climate change; environmental remediation; molecular, cellular, and systemic studies on the biological effects of radiation; structural biology; medical applications of nuclear technology; and the Human Genome Program. The program also supports science related to carbon sequestration. In conjunction with the advanced scientific computing research program, a global systems application is continued to accelerate progress in coupled general circulation model development through use of enhanced computer simulation and modeling. The Genomics: GTL activity will develop the science, technology, and knowledge base to harness microbial and plant systems for cost effective renewable energy production, carbon sequestration, and environmental remediation. The request includes $75.0 million for Genomics: GTL Bioenergy Research Centers. Research at the Centers will focus on developing the science underpinning biofuel production.

Basic energy sciences.--The basic energy sciences (BES) program funds basic research material sciences, chemistry, geosciences, and aspects of biosciences; supporting the Department's nuclear and non-nuclear technology programs. The BES program supports a substantial basic research budget for materials sciences, chemical sciences, biosciences, and geosciences. The program supports a number of research areas that are unique within the Federal Government. In many basic research areas, such as materials science, funding provided by the BES program represents a large percentage, or even the sole source, of Federal funding. The request includes $59.5 million for hydrogen and fuel cell research as part of the President's Hydrogen Initiative as well as funding for basic research in other areas that support the Nation's energy agenda.

The BES program operates large national user research facilities, including synchrotron light and neutron sources, a combustion research facility, and smaller user facilities such as materials preparation and electron microscopy centers. The request includes continued support to maintain utilization of the Department's large state-of-the-art national user facilities. Funding will maintain the quality of service and availability of facility resources to users, including university and government scientists, as well as private companies who rely on unique BES facilities for their basic research needs.

Research areas that will benefit from the facilities funding include structural biology, materials science, superconductor technology, and medical research and technology development.

The BES request includes $166.8 million for the first full year of operations of the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory to meet the Nation's neutron scattering needs. The request includes $21.9 million to continue design and fabrication of additional instruments beyond the initial instrument suite included in the construction project. SNS will provide significant scientific, technical, and economic benefits that derive from neutron scattering and materials irradiation research. Reflecting the high priority given to nanoscale research, BES funding for the multi-agency national nanotechnology program includes funding for the operation of the Nanoscale Science Research Centers (NSRCs) at the Oak Ridge, Lawrence Berkeley, Brookhaven, and Argonne national laboratories, and for one NSRC collocated at [[Page 361]] Sandia and Los Alamos national laboratories. The request also includes $51.4 million for construction of the Linac Coherent Light Source at the Stanford Linear Accelerator Center. The BES request also includes $45 million in design funding for the National Synchrotron Light Source II, $17.2 million for construction of the User Support Building at Lawrence Berkeley National Laboratory, and $7.4 million for design and construction of the Photon Engineering Laser Science and Engineering Building Upgrade at Stanford Linear Accelerator Center.

Fusion energy sciences.--The mission of the fusion energy sciences (FES) program is the national research effort to advance plasma science, fusion science, and fusion technology that is the knowledge base needed for an economically and environmentally attractive energy source. The program emphasizes the underlying basic research in plasma and fusion sciences, with the long-term goal of harnessing fusion as a viable energy source. The program centers on the following goals: a predictive capability for key aspects of burning plasmas; progress toward demonstrating enhanced fundamental understanding of magnetic confinement through research on magnetic confinement configuration optimization; and progress toward developing the fundamental understanding of high energy density plasma physics.

The Budget includes $160 million for the U.S. contributions to ITER project, an international burning plasma physics experiment that is an essential next step toward eventually developing fusion as a commercially viable energy source.

The Budget also provides for support of basic research in plasma science in partnership with NSF, and investigation of innovative confinement concepts, along with continued operation of DIII-D, Alcator C-Mod, and the National Spherical Torus Experiment to develop a fuller understanding of the physics of magnetically confined plasma and to identify approaches that may improve the economical and environmental attractiveness of fusion in the long run. Fabrication of the National Compact Stellarator Experiment will continue at Princeton Plasma Physics Laboratory in collaboration with Oak Ridge National Laboratory. Theory and modeling, using high performance computing and enabling technology research will also be conducted in support of the

science experiments.

Advanced scientific computing research.--This program includes research in mathematical, information, and computational sciences. The purpose of this program is to support advanced computational research--applied mathematics, computer science, and networking--to enable the analysis, simulation, and prediction of complex physical phenomena. The program also supports the operation of large supercomputer user facilities and network facilities. The request includes research, integrated with other science programs, on application of computer simulation and modeling to science problems.

Science laboratories infrastructure.--The goal of this program is to provide funds for rehabilitating, replacing, or demolishing deficient common-use utilities, roads, and buildings and to correct environment, safety, and health deficiencies at the civilian science laboratories. The Oak Ridge Landlord activity is also funded here. The request includes funding for the demolition of the Bevatron Complex at Lawrence Berkeley National Laboratory.

Safeguards and security.--The mission of this program is to ensure appropriate levels of protection and provide against: unauthorized access; theft; diversion, loss of custody, or destruction of DOE assets; and hostile acts that may cause adverse impacts on fundamental science, or the health and safety of DOE and contractor employees, the public, or the environment. The request provides funding for physical protection, protective forces, physical security, protective systems, information security, cyber security, personnel security, materials control and accountability, and program management activities.

Workforce development for teachers and scientists.--The mission of this program is to train young scientists, engineers, and technicians in the scientifically and technically advanced environment of the Office of Science national laboratories to meet the demand for a well-trained scientific and technical workforce, including the teachers that educate the workforce in areas of science, technology, engineering, and mathematics.

Object Classification (in millions of dollars)

Identification code 89-0222-0-1-251	2006 actual	2007 est.	2008 est.
Direct obligations: Personnel compensation:			
11.1 Full-time permanent.....	88	89	108
11.3 Other than full-time permanent..	2	2	2
11.5 Other personnel compensation....	4	4	5
11.9 Total personnel compensation..	94	95	115
12.1 Civilian personnel benefits.....	21	21	25
21.0 Travel and transportation of persons..	4	4	4

23.1 Rental payments to GSA.....	1	1	1
23.3 Communications, utilities,	5	5	5
25.1 Advisory and assistance services..	6	6	7
25.2 Other services.....	70	74	68
25.3 Other purchases of goods and services from Government accounts.	6	6	6
25.4 Operation and maintenance of facilities.....	2,094	2,246	2,573
25.5 Research and development contracts	21	21	26
26.0 Supplies and materials.....	2	2	2
31.0 Equipment.....	205	205	442
32.0 Land and structures.....	254	186	280
41.0 Grants, subsidies, and contributions	858	754	844
99.9 Total new obligations.....	3,641	3,626	4,398

Employment Summary

Identification code 89-0222-0-1-251	2006 actual	2007 est.	2008 est.
Direct: 1001 Civilian full-time equivalent employment.....	949	989	1,058