

## SCIENCE

Appropriations, 2010 .....	\$4,903,710,000
Budget estimate, 2011 .....	5,121,437,000
Committee recommendation .....	5,012,000,000

The Committee recommends \$5,012,000,000 for the Office of Science. The Committee understands that changing the Nation's decades-long dependence on imported oil and unfettered emission of carbon dioxide requires fundamental changes in the ways we produce, store, and use energy. To meet these strategic challenges, the United States will have to develop new technologies that require scientific breakthroughs that come only with fundamental understanding of new materials and chemical processes. The Committee believes the funding increase in fiscal year 2011 will support initiatives to advance scientific understanding for new energy technologies.

## HIGH ENERGY PHYSICS

The Committee recommends \$820,085,000 for High Energy Physics. The Committee is encouraged that the Large Hadron Collider [LHC] started operations again in March 2010 and it reached energy levels of 3.5 trillion electron volts, which is three times higher than any other machine in the world has been able to achieve. However, the Committee is concerned about the LHC's planned shutdown at the end of 2011 to address design problems and the impact the shutdown may have on the U.S. High Energy Physics Program. For example, a decision to operate the Tevatron at the Fermi National Accelerator beyond fiscal year 2011 might reduce funding available for other high-priority projects. The Committee urges the Office of Science to keep the Committee informed about the status of operations at LHC and how the planned shutdown will impact the U.S. program. The Committee also recognizes the recommendation made in the 2008 report of the Particle Physics Project Prioritization Panel to develop a world-leading program of neutrino science to understand the role neutrinos play in the evolution of the universe. The United States has unique capabilities and infrastructure at Fermilab to advance this area of science. The Committee supports design work for two new potential construction projects—the Long Baseline Neutrino Experiment and the Muon to Electron Conversion Experiment. However, the Committee directs the Office of Science to submit a report not later than 180 days after enactment of this act that lays out (1) the expected benefits of intensity frontier science, (2) a strategy for maintaining the U.S. lead, and (3) the funding needs over the next 10 years, including construction activities, of implementing the proposed strategy. The Committee also is concerned about the status of the Deep Underground Science and Engineering Laboratory [DUSEL] funded by the National Science Foundation [NSF]. The neutrino program relies on the construction of DUSEL and any delays in the DUSEL program would impact advances in this area of science. The Committee urges the Office of Science to coordinate its neutrino program research efforts with NSF to avoid unnecessary delays. The Committee is very encouraged by DOE and NASA's collaborative effort and success on the Joint Dark Energy Mission Interim

Science Working Group and expects the Department to continue to fully support this process and to work closely with NASA in the planning and execution of this mission.

#### NUCLEAR PHYSICS

The Committee recommends \$554,000,000 for Nuclear Physics. A recent National Academy of Sciences report, *Advancing Nuclear Medicine through Innovation*, recommended increasing the Federal commitment to nuclear medicine research. Nuclear medicine could substantially accelerate, simplify, and reduce the cost of delivering and improving healthcare. However, the Committee is concerned that the Department is not using funds to directly support nuclear medicine research with human application. To this end, within the funds provided, \$15,400,000 is for nuclear medicine research with human application. All of the added funds must be awarded competitively in one or more solicitations that include all sources—universities, the private sector, and Government laboratories—on an equal basis. Funding for nuclear medicine application research was previously within the Biological and Environmental Research program.

#### BIOLOGICAL AND ENVIRONMENTAL RESEARCH

The Committee recommends \$614,500,000 for Biological and Environmental Research. Of these funds, \$11,000,000 is provided for artificial retina research. An artificial retina has the potential to restore vision to millions of people suffering from eye diseases. In November 2009, the Lawrence Livermore National Laboratory team developing artificial retinas received a Research and Development 100 Award, known as the “Oscars of Invention.” The Committee encourages the Department to continue this research and meet its goal of producing a prosthesis with more than 1,000 electrodes, which would allow facial recognition, as quickly as possible. The funding request of \$15,400,000 for nuclear medicine research efforts has been moved to Nuclear Physics to better address mission requirements.

#### BASIC ENERGY SCIENCES

The Committee recommends \$1,739,115,000 for Basic Energy Sciences. Of these funds, \$151,600,000 is provided for construction activities as requested in the budget. The remaining \$1,587,515,000 is for research. Within available funds, up to \$100,000,000 shall be used to support the 46 Energy Frontier Research Centers. The Committee does not support the creation of new Energy Frontier Research Centers at this time. The Department must first demonstrate the benefits and results of this new research and development approach designed to address fundamental scientific energy challenges before the program is expanded further. A significant increase in funding for the core research program in materials and chemical sciences should be sufficient to advance scientific and engineering knowledge in areas of study where the Department feels there are gaps in addressing energy challenges.

Within the research funds provided, \$16,000,000 shall be available for the Fuels from Sunlight energy innovation hub and

\$22,000,000 for a new Batteries and Energy Storage energy innovation hub.

The Committee recommends no funding for a research program in gas hydrates. A gas hydrates research program should continue in the Office of Fossil Energy, not the Office of Science. A recently issued, congressionally mandated report by the National Research Council [NRC] concluded that the Office of Fossil Energy's methane hydrate program had been "consistent and effective" in leading a broad-based science and technology development program to investigate naturally occurring gas hydrates. In addition, the NRC found the methane hydrate program had made advances in identification, drilling, and production of methane from hydrate for use as a possible energy source. The Office of Science is not the appropriate office to continue this work. The Committee also provides no funding for modeling of engine design at this time. Within the research funds provided, \$35,000,000 is for the Experimental Program to Stimulate Competitive Research [EPSCoR]. The EPSCoR program is currently funding energy research that will help reduce our dependence on foreign oil.

#### ADVANCED SCIENTIFIC COMPUTING RESEARCH

The Committee recommends \$418,000,000 for Advanced Scientific Computing Research.

#### FUSION ENERGY SCIENCES

The Committee recommends \$384,000,000 for Fusion Energy Sciences. The Committee is concerned by cost increases and schedule delays related to the ITER project. In the last year, the projected start date for ITER has slipped another 10 months to November 2019, or 3 years later than first projected. These schedule changes put U.S. cost estimates at risk as costs escalate for the total project. The Committee encourages the Office of Science to keep the Committee informed about significant decisions and developments related to the ITER project.

The Committee is encouraged that the Office of Science tasked the National Academy of Sciences with reviewing options to advance inertial fusion energy. The Committee understands that an independent National Academy of Sciences committee will (1) assess the prospects of generating power using inertial confinement fusion, (2) identify scientific and engineering challenges, the costs for manufacturing targets, and research and development objectives to develop an inertial fusion energy demonstration plant, and (3) advise DOE on a roadmap for developing a demonstration plant.

The Committee believes that this is a practical way of identifying the steps that are needed to develop an inertial fusion energy program and plans to work with DOE to assess the budget needs for this alternative approach to fusion energy. Within available funds, the Committee provides \$4,000,000 to advance inertial fusion energy, which may include experiments using solid state or krypton fluoride lasers, ion beams, or pulsed power, and to help laboratories and universities participate in the National Academy of Sciences review.

The Committee is encouraged by DOE's progress in advancing fusion energy sciences. However, the Committee is concerned by the

Fusion Advisory Committee finding that the United States risks losing leadership and competitiveness in material science. To successfully harness fusion energy, scientists and engineers must design and build reactor components that can withstand extreme radiation environments and temperature. Since these extreme environments and material needs are common to both magnetic and inertial fusion energy, the Committee encourages DOE to reassess its materials science program and establish a program that would explore science, engineering, and materials issues for both magnetic and inertial fusion energy and build U.S. expertise.

#### SCIENCE LABORATORIES INFRASTRUCTURE

The Committee recommends \$126,000,000 to support infrastructure activities.

#### SAFEGUARDS AND SECURITY

The Committee recommends \$86,500,000 for Safeguards and Security activities.

#### SCIENCE PROGRAM DIRECTION

The Committee recommends \$208,000,000 for the Office of Science Program Direction. Of these funds, \$8,963,000 shall be used for the Office of Scientific and Technical Information. No funds shall be used to hire new site office personnel, except for field staff at the Integrated Support Centers in Chicago and Oak Ridge.

#### SCIENCE WORKFORCE DEVELOPMENT

The Committee recommends \$21,000,000 for Workforce Development for Teachers and Scientists program. Of these funds, up to \$5,000,000 shall be available for the graduate fellowship program. The Committee encourages the Office of Science to monitor the impact of this program and demonstrate whether students continue to pursue careers in scientific and technical fields. The Committee also provides \$5,800,000 for educator programs that provides professional development for middle school, high school, community college, and undergraduate educators. Furthermore, \$2,500,000 shall be available for program administration and evaluation to ensure the efficiency and effectiveness of science workforce development activities.

*Congressionally Directed Spending Items.*—The Committee includes \$40,800,000 for the following list of projects that provide for research, development, and demonstration of science technologies or programs. The Committee reminds recipients that statutory cost sharing requirements may apply to these projects.

#### CONGRESSIONALLY DIRECTED SCIENCE PROJECTS

Project title	Amount	Requestor
Advanced Computer Simulation Initiative .....	\$1,000,000	Senator Reid
Alaska Climate Center .....	\$500,000	Senators Murkowski, Begich
Antibodies Research .....	\$4,000,000	Senators Dorgan, Conrad
Center for Diagnostic Nanosystems .....	\$2,000,000	Senator Rockefeller
Center for Nanoscale Energy .....	\$7,000,000	Senators Dorgan, Conrad

## CONGRESSIONALLY DIRECTED SCIENCE PROJECTS—Continued

Project title	Amount	Requestor
Characteristics and Cleanup of the U.S. Nuclear Legacy .....	\$3,500,000	Senators Cochran, Wicker
Climate Model Evaluation Program .....	\$2,000,000	Senators Shelby, Sessions
Computing Capability .....	\$2,000,000	Senators Dorgan, Conrad
Development of Nontechnology-enhanced Solar Cells with Low Cost and High Conversion Efficiency.	\$500,000	Senator Reid
Energy Research .....	\$250,000	Senator Cochran
Environmental Radioactivity Monitoring Laboratory: Monitoring/Assessment of the Radioactive Pollutants in the South-West Mississippi.	\$750,000	Senators Cochran, Wicker
Functional Nanoparticles for Improved Ultra Capacitor Devices .....	\$1,000,000	Senators Cochran, Wicker
Idaho National Laboratory Center for Advanced Energy Studies .....	\$1,000,000	Senators Crapo, Risch
KU Cancer Research Equipment .....	\$4,000,000	Senators Brownback, Roberts
Lincoln Memorial University/ORNL Partnership on Geothermal Energy .....	\$2,000,000	Senator Alexander
Material Science Smart Coatings .....	\$500,000	Senator Ben Nelson
Metal-enhanced Fluorescence Research and Development .....	\$750,000	Senators Mikulski, Cardin
Missouri University Research Reactor Reflector Shield .....	\$1,000,000	Senator Bond
Nanotechnology Initiative .....	\$600,000	Senators Dodd, Lieberman
Nevada Water Resources Data, Modeling, and Visualization (DMV) Center .....	\$750,000	Senator Reid
Oregon Sustainability Center .....	\$300,000	Senators Wyden, Merkley
RNAi Research .....	\$300,000	Senator Kerry
Solid State Preparation and Characterization Lab .....	\$500,000	Senator Reid
Southern Illinois University Research .....	\$750,000	Senator Durbin
Technology Transfer & Commercialization of Technologies at DOE .....	\$500,000	Senators Bingaman, Tom Udall
TU Algae to Green Fuels Energy Project .....	\$750,000	Senator Inhofe
University of California, San Diego Seismic Research .....	\$1,500,000	Senator Feinstein
University of South Dakota Project on Renewable Energy and the Economy .....	\$350,000	Senator Johnson
URI Regional Earth System Center .....	\$750,000	Senators Reed, Whitehouse

## ADVANCED RESEARCH PROJECTS AGENCY—ENERGY [ARPA-E]

Appropriations, 2010 .....	
Budget estimate, 2011 .....	\$299,966,000
Committee recommendation .....	200,000,000

The Committee recommends \$200,000,000 for the Advanced Research Projects Agency—Energy [ARPA-E]. ARPA-E is responsible for funding high-risk research and development projects to meet long-term energy challenges. The primary goal is to invest in energy projects that can overcome technological barriers and eventually reduce energy imports, improve energy efficiency, and reduce energy-related emissions, including greenhouse gases. ARPA-E will also help the United States maintain a technological lead in developing and deploying advanced energy technologies. The Committee supports ARPA-E's efforts to fund creative "out-of-the-box" transformational energy research that industry by itself cannot or will not support due to its high risk, but where success would provide significant benefits for the United States. The Committee encourages ARPA-E to work closely with the Office of Science, including scientists and engineers working at Energy Frontier Research Centers and Hubs, to identify promising projects that are potential game changers for energy systems.