

research goals; (2) permit scientific exploitation of the performance gains being sought from physics concept improvements; (3) allow the U.S. to enter into international collaborations gaining access to experimental conditions not available domestically; and (4) explore the science underlying these technological advances.

The Technology subprogram supports pursuit of fusion energy science for the longer-term by conducting research aimed at innovative technologies, designs and materials to point toward an attractive fusion energy vision and affordable pathways for optimized fusion development. Program Contact: (301) 903-4095 N. Anne Davies.

6. Biological and Environmental Research Program

For more than 50 years the Biological and Environmental Research (BER) Program has been investing to advance environmental and biomedical knowledge connected to energy. The BER program provides fundamental science to underpin the business thrusts of the Department's strategic plan. Through its support of peer-reviewed research at national laboratories, universities, and private institutions, the program develops the knowledge needed: (1) To identify, understand, and anticipate the long-term health and environmental consequences of energy production, development, and use; and (2) to develop biology based solutions that address DOE and National needs.

The following indicators establish specific long term goals in Scientific Advancement that the BER program is committed to, and progress can be measured against.

- Life Sciences: Characterize the multi protein complexes (or the lack thereof) involving a scientifically significant fraction of a microbe's proteins. Develop computational models to direct the use and design of microbial communities to clean up waste, sequester carbon, or produce hydrogen.

- Climate Change Research: Deliver improved climate data & models for policy makers to determine safe levels of greenhouse gases for the Earth system. By 2013, substantially reduce differences between observed temperature and model simulations at subcontinental scales using several decades of recent data.

- Environmental Remediation: Develop science-based solutions for cleanup and long-term monitoring of DOE contaminated sites. By 2013, a significant fraction of DOE's long-term stewardship sites will employ advanced biology-based clean up solutions and science-based monitors.

- Medical Applications and Measurement Science: Develop intelligent biomimetic electronics that can both sense and correctly stimulate the nervous system and new radiopharmaceuticals for disease diagnosis.

All grant proposals should address one or more of these measures and/or explain how the proposed research supports the broad scientific objectives outlined above. More information on the program and the scientific research it supports can be found at our Web site: <http://www.sc.doe.gov/ober/>.

(a) Life Sciences Research

Research is focused on using DOE's unique resources and facilities to develop fundamental knowledge of biological systems that can be used to address DOE needs in clean energy, carbon sequestration, and environmental cleanup and that will underpin biotechnology based solutions to energy challenges. The objectives are: (1) To develop the experimental and, together with the Advanced Scientific Computing Research program, the computational resources, tools, and technologies needed to understand and predict the complex behavior of complete biological systems, principally microbes and microbial communities; (2) to take advantage of the remarkable high throughput and cost-effective DNA sequencing capacity at the Joint Genome Institute to meet the DNA sequencing needs of the scientific community through competitive, peer-reviewed nominations for DNA sequencing; (3) to develop and support DOE national user facilities for structural biology at synchrotron and neutron sources; (4) to develop novel research and computational tools that provide the basis for understanding and predicting the responses of complex biological systems, information needed to develop biotechnology solutions for energy and environmental challenges; (5) to use model organisms to understand human genome organization, human gene function and control, and the functional relationships between human genes and proteins at a genomic scale; (6) to understand and characterize the risks to human health from exposures to low levels of radiation; and (7) to anticipate and address ethical, legal, and social implications arising from BER-supported biological research.

Program Contact: (301) 903-5468.

(b) Medical Applications and Measurement Sciences

The research is designed to develop the beneficial applications of nuclear and other energy-related technologies

for bio-medical research, medical diagnosis and treatment. The objectives are: (1) To utilize innovative radiochemistry to develop new radiotracers for medical research, clinical diagnosis and treatment; (2) to develop the next generation of non-invasive nuclear medicine instrumentation technologies, such as positron emission tomography; (3) to develop advanced imaging detection instrumentation capable of high resolution from the sub-cellular to the clinical level; and (4) to utilize the unique resources of the DOE in engineering, physics, chemistry and computer sciences to develop the basic tools to be used in biology and medicine, particularly in imaging sciences, photo-optics and biosensors.

Program Contact: (301) 903-3213.

(c) Environmental Remediation

This research delivers the scientific knowledge, tools, and enabling discoveries in biological and environmental research to reduce the costs, risks, and schedules associated with the cleanup of the DOE nuclear weapons complex; to extend the frontiers of biological and chemical methods for remediation; to discover the fundamental mechanisms of contaminant transport in the environment; to develop cutting edge molecular tools for investigating environmental processes; and to develop an understanding of the ecological impacts of remediation activities. Research priorities include bioremediation, contaminant fate and transport, nuclear waste chemistry and advanced treatment options, and the operation of the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) and the Savannah River Ecology Laboratory (SREL). The research performed for this program will provide fundamental knowledge on a broad range of remediation problems. Program Contact: (301) 903-4902.

(d) Climate Change Research

The program seeks to understand the basic physical, chemical, and biological processes of the Earth's atmosphere, land, and oceans and how these processes may be affected by energy production and use. The research is designed to provide data that will enable an objective assessment of the potential for, and the consequences of, human-induced climate change at global and regional scales. It also provides data and models to enable assessments of mitigation options to prevent such a change. The program is comprehensive with an emphasis on: (1) Understanding and simulating the radiation balance