

## **Experimental Program to Stimulate Competitive Research (EPSCoR)**

### **Portfolio Description**

This activity supports basic research spanning the broad range of science and technology programs at DOE in states that have historically received relatively less Federal research funding. The currently eligible EPSCoR states are listed at <http://www.nsf.gov/od/oia/programs/epscor/eligible.jsp>. The research supported by EPSCoR includes materials sciences, chemical sciences, physics, energy-relevant biological sciences, geological and environmental sciences, high energy physics, nuclear physics, fusion energy sciences, advanced computing, and the basic sciences underpinning fossil energy, nuclear energy, energy efficiency, electricity delivery, and renewable energy.

### **Unique Aspects**

The program objectives are addressed through three funding mechanisms: (1) Implementation Grants, (2) State-Laboratory grants and (3) participation in the DOE Office of Science Early Career Research Program. Implementation grants address state/territory capability and infrastructure development through funding research in a focused area or research cluster with the potential to support faculty hires, a group of students or postdoctoral fellows, and the purchase of research equipment. Implementation grants are for a maximum period of six years with an initial grant period of three years. The State-Laboratory grants address building partnerships between the researchers in EPSCoR institutions, their students and postdoctoral fellows with research scientists and unique capabilities at DOE national laboratories. The State-Laboratory grants are for one period of three years. Further information on the Early Career Research Program may be found at its [website](#). This program is science-driven and supports the most meritorious proposals based on peer review and programmatic priorities.

### **Relationship to Other Programs**

The activity interfaces with all other research activities within BES. It is also responsive to programmatic needs of other program offices within DOE. In addition, EPSCoR grants support graduate students, undergraduates, and postdoctoral associates, and encourage them to be trained in frontier energy research areas by using the world-class research facilities at the DOE National Laboratories. The work supported by the EPSCoR program impacts all DOE mission areas including research in materials sciences, chemical sciences, biological and environmental sciences, high energy and nuclear physics, fusion energy sciences, advanced computer sciences, fossil energy sciences, and energy efficiency and renewable energy sciences.

### **Significant Accomplishments**

The EPSCoR program funds basic research in support of all programmatic needs of DOE.

Recent accomplishments include:

- Bridging Basic Energy Sciences and Vehicle Technologies was investigation of the solid electrolyte interphase or SEI, a complex layer that forms from the decomposition products in the electrolyte of a lithium-ion battery. To address long-standing difficulties in understanding the SEI including its composition, formation mechanism and functioning, researchers combined a novel microscopy technique with multi-nuclear magnetic resonance (NMR) to analyze the structure and composition of the SEI. While many results suggest that upon additional cycling and aging, the structure, composition, and thickness of the anode SEI

change, these experiments show the initial composition could be relatively simpler than earlier believed.

- Researchers provided the first experimental confirmation that a current of electrons with the same spin alignment (a pure spin current) in a thin metal film can penetrate neighboring metal layers in a multilayer structure and cause switching of the magnetization direction (e.g., magnet polarity) in the bottom layer. The experiments demonstrated that spin current can produce a rotation of the magnetization within the film plane in addition to the commonly observed rotation of the magnetization out of the film plane.

### **Mission Relevance**

The core activity interfaces with all other core activities within the Office of Science and DOE and in many cases provides bridging between interests of science and energy technology. It is also responsive and supports the DOE mission in the areas of energy and national security and in mitigating their associated environmental impacts.

### **Scientific Challenges**

The DOE EPSCoR activity will continue to support basic research spanning the broad range of science and technology programs within DOE.

### **Projected Evolution**

The National Academy of Sciences conducted a recent evaluation of EPSCoR and EPSCoR-like programs supported by the Federal Government. While responses to this report are under discussion, the report's recommendation for (resuming) cost sharing will be acted on in the next DOE EPSCoR funding opportunity announcement. The scientific emphasis for EPSCoR grants will continue to evolve with the strategic directions for DOE and the scientific directions of the subprograms for DOE's basic research and technology programs