PROGRAM facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Power Systems Advanced Research

02/2001

2000 UNIVERSITY COAL RESEARCH PROGRAM GRANTS

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Additional details on each of the projects can be found on the Department of Energy's fossil energy web site at www.fe.doe.gov/techline/tl_ucr00.html

Students, Teachers Team to Explore Greenhouse Gas Reduction, Coal Science and Technologies for Pollution Free Power Plants

Eighteen university research projects will share almost $3 million in federal grants, marking the 21st year of a U.S. Department of Energy program that combines student education with research into cleaner and more effective ways to use the nation's plentiful coal reserves.

The projects are the latest in the Energy Department's National University Coal Research competition. The program has the dual goal of supporting studies in advanced coal science and technology and providing students with "hands-on" research experience. Since its inception in 1979, approximately 1,385 students have participated, along with their teaching professors.

Private industry partners in many of the projects will provide an additional $136,814 while the universities themselves will contribute $467,010.

The wide range of research topics in the selected projects include new ways to turn pollutants from coal into environmentally-safe, commercially valuable products, innovative technologies that produce clean hydrogen for fuel cells, and novel approaches for preventing the release of greenhouse gases.

In recent years, the Energy Department added new research topics aimed at supporting its program to develop a futuristic concept for nearly pollution-free, highly efficient fossil fuel energy plants called "*Vision 21*."

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CORE RESEARCH PROJECTS

The department will allocate approximately $2.5 million in federal funds for 11 “core” research projects

Core Research Projects

Iowa State University, Ames, IA, University of South Carolina, Columbia, SC, Alliant Energy Corp., Cedar Rapids, IA, Charleston CPW, Charleston, SC, and **Des Moines Water Works, Des Moines, IA,** will convert the sulfur dioxide pollutants emitted from burning coal into a chemical compound that can be used to treat waste water in a water-purification facility.

Project duration: 36 months

Contact: Richard E. Hasbrook, 515-294-5225

Iowa State University was selected for a second project, this one to study a new approach for reducing sulfur contaminants from transportation fuels, such as gasoline and diesel fuel, that can be made from coal.

Project duration: 36 months

Contact: Richard E. Hasbrook, 515-294-5225

Pennsylvania State University, University Park, PA, will explore another new approach for removing sulfur compounds from transportation fuels. This approach employs a special catalyst to enhance the energy value of the fuel.

Project duration: 36 months

Contact: Robert Killoren, 814-865-1372

Louisiana State University, Baton Rouge, LA, will synthesize a substance that removes hydrogen sulfide contaminants from gas made from coal. The purified gas can then be used to generate electricity in a fuel cell in future Vision 21 plant designs. A second step in the process changes the contaminants to elemental sulfur, a useful product.

Project duration: 36 months

Contact: J.L. Bates, 225-388-3056

Northwestern University, Evanston, IL, proposes a new design for a ceramic (solid oxide) fuel cell that would generate clean electricity from the hot gases produced by a coal gasifier. The new design could prove to be structurally stronger with more reliable seals between the ceramic components.

Project duration: 36 months

Contact: Barbara Siegel, 847-491-3003

California Institute of Technology, Pasadena, CA, will develop three-layer composite membranes that separate hydrogen from coal gases for use in fuel cells and other clean energy concepts.

Project duration 24 months

Contact: Richard P. Seligman, 626-395-6073

Core Research Projects

University of Cincinnati, Cincinnati, OH, will investigate two methods of preparing ceramic membranes to enhance hydrogen separation at high temperatures.

Project duration: 36 months

Contact: Debi Galloway, 513-556-2970

Tufts University, Medford, MA, will couple a well-developed chemical reaction for increasing the hydrogen content of gas made from coal with a novel membrane that can separate high-purity hydrogen at high temperatures and pressures. Hydrogen can be used as a clean fuel to generate electricity from fuel cells or other advanced energy devices.

Project duration: 36 months

Contact: Theodore M. Liszczak, 617-627-3570

Texas A&M University, College Station, TX, and **Hampton University, Hampton, VA,** will team to develop improved iron catalysts that are more durable and longer-lasting for use in processes that convert coal-derived gas into high quality diesel fuels.

Project duration: 36 months

Contact: Gregory L. Foxworth, 409-845-1812

Brown University, Providence, RI, Brigham Young University, Salt Lake City, UT, and **McDermott Technology, Inc., Alliance OH,** will study how coal is transformed in advanced combustion and gasification systems and develop a database that can be used in designing and operating future Vision 21 plants.

Project duration: 36 months

Contact: Norman Hebert, 401-863-3141

Purdue University, West Lafayette, IN, and **the University of Arizona, Tucson, AZ,** will develop tools to predict the way coal flows in pulverized coal burners and run experiments on ways to minimize the release of nitrogen oxide pollutants which can cause smog and acid rain.

Project duration: 36 months

Contact: Edie M. Doland, 765-494-1078

INNOVATIVE CONCEPTS

Another seven proposals will share $350,000 in federal funding for "Innovative Concepts," an area created in 1997 to stimulate novel technological breakthroughs. In this category, proposers are free to submit projects on any coal-related topic for 1-year study grants. Beginning this year, "innovative concept" projects will be eligible for a future second phase of competition that could lead to additional funding worth up to $200,000 per project

PARTNERS

- Alliant Energy Corp.
- University of Arizona
- Brigham Young University
- Brown University
- California Institute of Technology
- Charleston CPW
- University of Cincinnati
- Des Moines Water Works
- Drexel University
- Hampton University
- Iowa State University
- University of Kentucky
- Louisiana State University
- McDermott Technology, Inc.
- State University of New York at Buffalo
- Northwestern University
- Pennsylvania State University
- Purdue University
- University of South Carolina
- Texas A&M University
- Tufts University
- University of Utah

Innovative Concepts

University of Cincinnati, Cincinnati, OH, will develop a new ceramic membrane that can remove carbon dioxide, a greenhouse gas, from high-temperature coal gases.
Contact: Debi Galloway, 513-556-2970

Drexel University, Philadelphia, PA, will synthesize another type of membrane for separating carbon dioxide from power plant exhausts. This membrane will use a ceramic material with more uniform and ordered pores than other types of membranes, and a chemical called a "surfactant" that is expected to move the carbon dioxide through the membrane faster.
Contact: Kenneth Blank, 215-895-2837

University of Kentucky, Lexington, KY, will test membranes based on microscopic "carbon nanotubes" for separating carbon dioxide from the gases of coal-based power plants.
Contact: Johnny Compton, 606-257-0265

Brown University, Providence, RI, will examine the major operational problems in cofiring coal and biomass by partially combusting only a fraction of the fuel to limit carbon dioxide emissions.
Contact: Norman Hebert, 401-863-3141

Pennsylvania State University, University Park, PA, will investigate a novel approach for converting the carbon dioxide in a power plant's flue gas into industrially useful products that might be used in future Vision 21 plants to generate electricity from a fuel cell or turbine or used to manufacture chemicals and fuels.
Contact: Robert Killoren, 814-865-1372

University of Utah, Salt Lake City, UT, will use a 3-D computer model to study the effects of recycling carbon dioxide back into an oxygen-enriched coal combustor. Researchers are particularly interested in how increased concentrations of carbon dioxide affect the way the carbon in coal burns and the effectiveness is transferring heat from the combustor. They will also study how the carbon dioxide concentrations affect the formation of nitrogen oxides, an air pollutant.
Contact: Vincent A. Bogdanski, 801-581-3008

The State University of New York at Buffalo, Buffalo, NY, will develop a computer-based method for designing the ideal way to capture the exhaust heat of a power plant and use it to generate additional electricity in a "bottoming cycle" that would use ammonia-water or carbon dioxide based mixtures.
Contact: Kurt F. Winter, 716-645-2977