NETL Collaborates with 16 Universities to Tackle Fossil Energy Research Challenges

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Fossil fuels are the dominant sources of energy in the United States, supplying more than 80 percent of the nation's power. Energy forecasts by the U.S. Energy Information Administration, BP and numerous other entities indicate that coal, oil and natural gas will continue to meet the bulk of the nation's energy needs for decades to come.

As DOE strives to reduce the cost of electricity and promote responsible stewardship of the environment, fundamental research challenges that impede the advancement of fossil energy-based technologies must be addressed to enable effective use of the nation's vast domestic energy resources. NETL is aggressively addressing these challenges in partnership with 16 universities across the country that comprise the University Coalition for Fossil Energy Research (UCFER). UCFER recently awarded 11 additional projects for a total of $2.69 million.

UCFER is led by Pennsylvania State University, which hosted the coalition's inaugural meeting in May 2016. NETL hosted the coalition's first annual meeting in May 2017, followed by its first annual technical review meeting in April 2018 at the Lab's Morgantown, West Virginia, site. Participants from partner schools were invited to join NETL leaders and researchers to conduct coalition business, review ongoing projects, and discuss future possibilities for collaboration to tackle critical challenges in important fossil energy research areas.

"The university coalition has developed a well-advanced infrastructure for us to work with NETL to continue the development of fossil energy technologies," UCFER Director Chunshan Song of Penn State, said. "This meeting has been wonderful in the exchange and two-way dialogue between NETL leaders and technology managers, NETL researchers, and the university faculty members for all the 16 universities. That's a great accomplishment."

Continued on page 20

UNIVERSITY COALITION FOR FOSSIL ENERGY RESEARCH

GAINING MOMENTUM

UCFER was created in fall 2015, starting with nine founding member institutions: Penn State, the Massachusetts Institute of Technology, Princeton University, Texas A&M University, the University of Kentucky, the University of Southern California, the University of Tulsa, the University of Wyoming, and Virginia Tech.

The DOE project period runs from October 2015 through September 2021. Song said it was important for the coalition to begin by establishing a solid infrastructure. In collaboration with NETL, UCFER's leaders outlined a vision, goals and objectives, by-laws and an organizational structure to guide the coalition's work. NETL representatives serve on the Executive Council, Technical Advisory Council, and Core Competency Advisory Board.

UCFER's contract with DOE was finalized in April 2016, at which time a request for proposals (RFP) was issued for the first round of funding. The six projects resulting from that RFP address carbon use and reuse, carbon storage, and crosscutting research. For instance: Two projects, both led by the University of Southern California, aim to develop models that inform carbon storage efforts. One looks at microseismic events to develop a tool for predicting the risk of induced seismicity during CO_2 injection, while the other uses geophysical and geomechanical data to monitor the injected CO_2.

In 2017, a second round of funding was awarded to another six projects, valued at about $2 million. Those projects focus on carbon capture, advanced combustion, and oil and natural gas infrastructure. The coalition also expanded by adding seven new schools: Carnegie Mellon University, Louisiana State University, Ohio State University, the University of North Dakota, the University of Pittsburgh, the University of Utah, and West Virginia University.

A third RFP was issued in November 2017. UCFER's Technical Advisory Council met in closed session during the April 2018 technical review meeting to discuss 81 submitted proposals. Nearly $4.1 will be eventually awarded to projects in seven areas: advanced combustion, carbon capture, carbon storage, carbon use and reuse, fuel cell technologies, gasification, and recovery of rare earth elements.

Addressing UCFER members at April's technical review meeting, NETL Director (Acting) Sean I. Plasynski praised the coalition's "excellent work" thus far. "I'm confident the coalition can keep that momentum going. Together we can solve critical problems for the Department of Energy and our nation," he said.

Assistant Secretary for Fossil Energy Steven Winberg speaks at The University Coalition for Fossil Energy Research (UCFER) meeting at NETL in Morgantown, W. Va.

FUTURE WORK

NETL leaders also shared research and development areas in which the Lab would be interested in pursuing future projects through UCFER. Randall Gentry, NETL's deputy director and chief research officer, noted that valuable opportunities are tied to the Lab's core competencies.

"We can do a lot in terms of impact and relevance, and in terms of improving fossil energy systems," Gentry said. "This is where our collaboration with UCFER is so important, making sure we're doing the most innovative research that we can to address the most important areas in fossil energy." John Wimer, associate director of Science and Technology Strategic Planning at NETL, identified a dozen potential topics for UCFER, including:

- Solid oxide fuel cell modeling and degradation.
- Coal conversion using microwave technology.
- Creation of an American coal database.
- Development of high-value products from domestic coal.
- Development and testing of improved sensors and controls within existing coal-fired power facilities.

DOE Assistant Secretary for Fossil Energy Steven Winberg also addressed the technical review meeting. He shared robust goals for the Office of Fossil Energy to help inform future research by UCFER. Those goals include improving reliability of the existing fleet of coal-fired power plants and developing advanced technologies necessary for the next generation. He also hopes to improve productivity of natural gas operations through advanced computing, data mining, and analytics.

"We're focused on early-stage research, and you are the beginning of that early-stage research," Winberg said. "I want to take this opportunity to thank you for everything that you do. It's clearly a high-value proposition – not only for fossil energy, but for the Department of Energy and for the country at large. I think it's pretty impressive that there are 16 premier universities in this coalition. … It speaks to an ability for universities to collaborate. I know you also compete, but you can and you do collaborate. And that's powerful. I encourage it, and I think you need to keep that up."

Penn State Vice President of Research Neil Sharkey also praised UCFER's work and stressed the value of collaboration.

"The program is very much on track," Sharkey said, referring to UCFER. "I think that our combined efforts are really doing an excellent job. We've got incredible firepower that can really make a difference. Putting this many universities together with a major energy laboratory, only good things can happen."

Partnerships like UCFER help NETL leverage its connections, resources and expertise to develop reliable and affordable solutions to the nation's energy challenges. By finding ways to cut costs and boost efficiency, NETL and its partners advance home-grown energy initiatives, revitalize key manufacturing industries and associated jobs, stimulate a growing economy, and improve the health, safety, and security of all Americans.