This Week at NETL

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Ceramic Matrix Composites Exceed Turbine Durability Requirements in Validation Tests

GE Power & Water, a research partner in NETL's Integrated Gasification Combined Cycle/Hydrogen Turbine Program, has demonstrated that parts designed and fabricated from composite materials called ceramic matrix composites (CMCs) exceed durability requirements for application in industrial gas turbines. In validation testing conducted by GE Power & Water, CMC parts performed 15,000 hours of operational use in a fielded unit, demonstrated impact damage tolerance, and exceeded cyclic life requirements by a factor of five. The tests were conducted from March 2011 through August of 2013, with periodic pauses for inspection and hardware changes. GE Power & Water researchers also demonstrated the manufacturability of complex turbine component geometry, and they are investigating design methods and life predictions and applying this information to the design of this new family of components. The first application of CMCs to an uncooled component in a next-generation gas turbine will improve combined-cycle efficiency by 0.13 percentage points; this improvement reduces CO_2 production by 0.37 percent at the same output or increases output by 1.1 percent. Application to a cooled component yields even greater benefits, improving combined-cycle efficiency increasing by 0.22 percentage points; this reduces CO_2 production an additional 0.56 percent at the same output or increases output by 2.2 percent.

DOE-Supported Researcher Honored by American Institute of Chemical Engineers

Ohio State University professor Dr. Liang-Shih Fan has received the 2013 R. H. Wilhelm Award in Chemical Reaction Engineering "for sustained and lasting contributions to multiphase reaction engineering and for pioneering work on groundbreaking clean-energy technologies." In research sponsored by NETL, Dr. Fan has advanced multiple concepts of chemical looping that will make a step change in progress toward meeting DOE's carbon capture goal: having available for demonstration, beginning in 2025, technologies and best practices for achieving 90 percent capture at less than a 35 percent increase in cost of electricity. The award, named for an innovator in the field of chemical reaction engineering, is presented annually by the American Institute of Chemical Engineers. Dr. Fan's efforts in developing transformational technologies to address CO_2 capture issues in coal utilization have made great strides toward reducing CO_2 emissions, as required by new regulations proposed by the U.S. Environmental Protection Agency.

NETL Researcher Recognized for Highly Cited Article

Academic publishing company Elsevier has recognized an article written by NETL's Dr. Stephen E. Zitney, "Process/Equipment Co-Simulation for Design and Analysis of Advanced Energy Systems," as one of those most cited between 2010 and 2012 in the journal *Computers & Chemical Engineering*. The article describes research on NETL's Advanced Process Engineering Co-Simulator (APECS) for use in computer-aided design and optimization of fossil energy systems with carbon capture. The paper also highlights co-simulation research conducted by NETL and others in areas such as reduced order modeling, knowledge management, stochastic analysis and optimization, and virtual plant co-simulation.

Technologies Integrated for Developing Microgrid and Grid Energy Storage Systems

Aquion Energy, developer and manufacturer of the Aqueous Hybrid Ion (AHI™) battery, is teaming with Siemens Industry Sector, the maker of Sinamics S120 drive technology, to offer a fully integrated, AHI-based energy-storage system. The two companies have signed a memorandum of understanding under which both companies will test the integration of Aquion's AHI batteries and Siemens' Sinamics S120 drive inverter. The integration of Aquion's M100 Battery Module and the Sinamics S120 inverter solution is currently undergoing

high-voltage testing at Aquion's research and development facility in Pittsburgh, Pa. It will soon undergo additional testing at Siemens' facility in Alpharetta, Ga. Aquion Energy received a $5 million award in 2010, funded by the American Recovery and Reinvestment Act of 2009, under DOE's Smart Grid Demonstration Program. The project, Sodium-Ion Battery for Grid-level Applications, was completed in August 2012. Aquion then expanded from 2 to 65 employees and scaled-up their technology from lab-scale to a 30-watt prototype battery module. The company is now building their first manufacturing facility, in Westmoreland County, Pa., which should begin commercial production in early 2014. The NETL Office of Energy Project Management manages this and other Smart Grid projects in support of DOE's Office of Electricity Delivery and Energy Reliability.

NETL-Support Project Selected as Finalist for Smart Grid Award

Oncor Electric Delivery Company's NETL-supported Dynamic Line Rating (DLR) project has been selected as one of two finalists in the Smart Grid category of *POWERGRID International* magazine's annual projects of the year award. The winner will be announced at the Electric Light & Power and *POWERGRID International* awards dinner on January 27, 2014, held in conjunction with the DistribuTECH Conference & Exhibition in San Antonio, Texas. Finalists and winners will be recognized in a video presented during DistribuTECH's keynote session on January 28, 2014, as well as in an upcoming issue of *POWERGRID International* magazine. The project, the largest known installation of dynamic rating equipment, has demonstrated and validated best practices for collecting real-time transmission-line data and developing a dynamic rating based on line loading, solar radiation from the sun, ambient temperatures, and wind blowing across the conductors. The project demonstrated the potential to raise the carrying capacity of the lines an average of 25 percent above the static rating, with appropriate ambient conditions. In fact, the demonstration project was so successful that, outside of the DOE-supported project, Oncor has deployed the DLR system on five additional transmission lines near Odessa, Texas. The project was one of 16 regional demonstration to receive an award funded by the American Recovery and Reinvestment Act of 2009 under DOE's Smart Grid Demonstration Program. The NETL Office of Energy Project Management manages this and other Smart Grid projects in support of DOE's Office of Electricity Delivery and Energy Reliability.

For more information, please contact:
Shelley Martin, DOE National Energy Technology Laboratory, 304-285-0228, newsinfo@netl.doe.gov