U.S. Department of Energy • Office of Fossil Energy • National Energy Technology Laboratory

netlog

The NETL newsletter

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NETL Contributes to Public Safety

The National Energy Technology Laboratory (NETL) is providing leading-edge technology and scientists to assist Pennsylvania's State Department of Environmental Quality in identifying the sources and concentration levels of natural gas leaks that are plaguing a small community in southwestern Pennsylvania. Some long-abandoned wells located in the Borough of Versailles, which is situated on the McKeesport Gas Field, were improperly plugged. Moreover, steel lining for the wells was in many cases retrieved and recycled during World War II to meet defense needs. As a result, natural gas is leaking through some of the old wells and collecting in dangerous concentrations in homes and businesses in Versailles.

Large-Eddy Simulation

Many advanced technologies such as hybrid power systems and oxy-fuel cycles will require development of new reactor technologies that can operate on fuel mixtures with varying compositions. The ability to predict emissions and combustor stability with fuel variability is a major challenge. Specialized computer models called "large-eddy simulations" have the potential to predict transient phenomena such as flashback and blowout—particularly common in zero-emission power cycles—that are not described by currently available software. Collaborative efforts between NETL, NASA, and the Department of Defense were outlined at the Large-Eddy Simulation conference February 21-23, 2006, in Pittsburgh, PA. Conference proceedings will be posted at www.netl.doe.gov/publications/proceedings/pro_toc.html.

Albany Research Center Becomes NETL-Albany

DOE's primary laboratory for materials research has joined the agency's national laboratory complex as the newest branch of NETL.

The former Albany Research Center, located in Albany, OR, joins existing NETL sites in Fairbanks, AK, Morgantown, WV, Pittsburgh, PA, and Tulsa, OK. The action aligns the Albany laboratory's expertise in materials performance and process development with NETL's mission to advance America's economic and energy security by resolving the environmental, supply, and reliability constraints of producing and using fossil resources. NETL is the only national laboratory dedicated to fossil energy research.

Previously, the Albany laboratory—now called NETL-Albany—operated as a separate part of the Energy Department's Fossil Energy organization. The laboratory was founded in 1943 when the U.S. Bureau of Mines selected Albany, Ore., as the site for the new Northwest Electro-development Laboratory.

The laboratory's early work on developing production methods for lesser-known important metals led to the birth of the titanium and zirconium industries. In 1948, the laboratory cooperated with the U.S. Navy and the Atomic Energy Commission to test and produce the ductile zirconium needed for the reactor of the first nuclear-powered submarine, the USS Nautilus.

In 1995, Congress closed the U.S. Bureau of Mines and transferred the Materials Partnership Program at NETL-Albany to the Office of Fossil Energy.

NETL-Albany's current research encompasses development and testing of high-temperature, corrosion-resistant structural materials and ceramic composites for advanced fossil energy systems such as coal gasifiers, turbines, combustors, and fuel cells. Joining this research with NETL's existing capabilities strengthens opportunities for collaboration and will improve the timeliness, scope, and impact of the Office of Fossil Energy's entire research and development program.

With the change in reporting relationships, NETL has formed a new Advanced Materials Sciences Focus Area to include work conducted by NETL-Albany researchers. It joins a triad of existing focus areas—Energy Systems Dynamics, Computational and Basic Sciences, and Geological and Environmental Systems—within NETL's Office of Science and Engineering Research.

NETL-Albany houses a staff of 82 fulltime employees and includes 39 buildings, several constructed as part of a college campus in the 1920s. The bulk of the campus was constructed from the 1940s through the 1960s, when the laboratory was the sole source of zirconium for the nation. Most of the facilities constructed before 1955 are part of a State Historic District and are listed with the Oregon State Historic Preservation Office. In 1985, the laboratory was named a historical landmark by the American Society for Metals.

Removing Mercury from Flue Gas

Coal Power Magazine recently highlighted a photochemical process invented at NETL for removing mercury from flue gas. The method uses ultraviolet light to convert difficult-to-capture elemental mercury in flue gas to a more readily captured oxidized form. The novel approach has potential as a low-cost technology that facilitates elemental mercury removal in downstream SO_2 scrubbers, wet electrostatic precipitators, or baghouses for flue gases from power plants and waste incinerators. Applying the method in bench-scale tests, Powerspan Corporation removed more than 90 percent of the mercury in a stream that simulated flue gas from low-rank coal, which contains mercury primarily in the elemental state. A paper describing the results of this initial bench-scale testing is available at http://www.netl.doe.gov/technologies/coalpower/ewr/pubs/Hg-PCO-FPT-2005.pdf.

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Multiphase Flow Seminars

NETL's Office of Science and Engineering Research has initiated a series of monthly seminars on Multiphase Flow. Scientists/researchers across the nation are able to participate in these events through Webex, stimulating immediate exchange of ideas and identifying opportunities for collaboration. For information regarding upcoming seminars contact Madhava Syamlal at 304-285-4685. For more information about our computational research, go to http://www.netl.doe.gov/onsite_research/capabilities.html#computational.

The Hyper facility allows assessment of dynamic control and performance issues in fuel cell-turbine hybrid systems.

Fuel Cell-Turbine Hybrid Performance (Hyper) Facility

NETL researchers have developed state-of-the-art simulation and test capabilities to develop advanced controls for the gas fuel cell-turbine hybrid power systems that are envisioned for high-efficiency power generation. By integrating simulation models with actual system hardware, the Hyper facility is able to develop and test control strategies needed to maintain harmonious operation of fuel cell and turbo-machinery under varying loads. A high-speed computing platform called dSpace, specifically designed for "hardware in the loop" applications has now been successfully integrated and tested. The new feature will enable implementation of higher-fidelity fuel cell models in real-time hardware simulations, providing detailed evaluation of fuel cell behavior during system transients and control actions. More information is available at http://www.netl.doe.gov/onsite_research/Facilities/hyper.htm or contact:

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DOE Requesting Public Input for a Study of the Potential Benefits of Distributed Generation

The Energy Policy Act of 2005 (EPAct 2005) was signed into law by President Bush on August 8, 2005. Section 1817 of EPAct 2005 requires the DOE to conduct a study, in consultation with the Federal Energy Regulatory Commission, of the potential benefits of distributed generation (DG). The study is also to include an evaluation of the impact of regulatory mandates, tariffs, rate structures, and similar policies on the proliferation of DG, combined heat and power (CHP) systems, and related distributed energy technologies. The effort is expected to last about 18 months and is to be completed no later than February 8, 2007.

NETL will oversee the task on behalf of the Distributed Energy Program in the Office of Electricity Delivery and Energy Reliability (OE). The study will conclude with a presentation of results to the President and Congress, followed by publication of a report containing the findings, conclusions, and a summary of public comments received during the course of the study.

To begin the study DOE is seeking public input that can be used to analyze potentially achievable benefits associated with expanded utilization and implementation of DG and other distributed energy technologies. Interested parties (including utilities, cogeneration developers, small power producers, equipment manufacturers, local and state regulatory bodies, trade associations, etc.) are invited to submit comments and/or reports, relate experiences, convey data, communicate results of case studies or analyses, and provide other information pertaining to the planning, installation, commissioning and operation of distributed energy systems. A publicly accessible website has been established to facilitate collection of data during the initial phase of the study. Comments and other information (prepared in Adobe Acrobat or Microsoft Word formats) may be submitted directly to www.dg1817report.org. This website also contains more detailed information about the study, as well as Section 1817 of EPAct 2005. Links to the web page may also be found on the OE website at http://www.electricity.doe.gov.

Supplementary information about distributed generation, CHP systems, and other distributed energy technologies can also be obtained through the DOE website: www.energy.gov, or the Office of Energy Efficiency and Renewable Energy website at www.eere.energy.gov.

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State-of-the-Art Spectrometer an Important Addition to NETL Capabilities

Rob Thompson analyzes samples in the new inductively coupled plasma mass spectrometer recently added to the analytical tools available to NETL researchers in the Office of Science and Engineering Research. The spectrometer also will be useful to universities that collaborate with NETL onsite researchers. The new spectrometer is used in NETL's Coal Utilization Byproducts research program to determine if the composition of the fly ash may cause environmental problems. The ICP spectrometer is extremely sensitive, able to detect the presence of metals in low parts-per-trillion levels. NETL is a key research laboratory focused on DOE's goal to secure America's health and economic growth through reliable, clean, abundant and affordable energy.

New Custom-Built Analysis and Imaging System Provides Powerful Tool for NETL Researchers

NETL's Office of Science and Engineering Research has acquired a custom-built analysis and imaging instrumental system that will allow researchers to image individual atoms and determine the elemental composition of the first few atomic layers of surfaces relevant to fossil energy applications.

The system's versatility and capabilities will help NETL onsite researchers stay at the forefront of fossil energy science and technology.

The Omicron Analysis and Surface Imaging System (OASIS) incorporates such analytical and atomic imaging systems as X-ray photoelectron spectroscopy, Auger electron spectroscopy, ion scattering spectroscopy, low-energy electron diffraction, electron energy loss spectroscopy, scanning tunneling microscopy, and atomic force microscopy into one single ultrahigh-vacuum system.

The system already is onsite at NETL. It is expected to be operational in four to six weeks.

It will give NETL onsite researchers a powerful new ability to do research into such areas as hydrogen membranes, surface chemistry, atomic scale studies of Fischer-Tropsch and catalytic reforming reactions, studies of membranes during heating and exposure to hydrogen and hydrogen sulfide, and many other applications.

The new system also will be useful to university collaborators who work with NETL onsite scientists and engineers in an increasing number of projects of national importance.