2014

NATIONAL ENERGY TECHNOLOGY LABORATORY

Accomplishments in brief

U.S. DEPARTMENT OF ENERGY | National Energy Technology Laboratory

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Director's Message

The men and women of the National Energy Technology Laboratory (NETL) have concluded another exciting year of accomplishment and progress in carrying out the research and development (R&D) program of the U.S. Department of Energy's (DOE) Office of Fossil Energy. This year, the Laboratory tackled a range of critical R&D that yielded an impressive array of new technologies, insights, and approaches toward achieving our mission to advance energy options to fuel our economy, strengthen our security, and improve our environment.

In 2014, NETL's skilled scientists and engineers, working in our state-of-the-art laboratory facilities and in collaboration with partners in the private sector and the nation's leading research universities, advanced the development and deployment of new technologies that will yield benefits for generations to come. Our work is vital to the nation as it enables domestic coal, natural gas, and oil to economically power our homes, industries, businesses, and transportation, while reducing greenhouse gas emissions and enhancing our energy independence.

This brief report describes just some of the important accomplishments that the Laboratory achieved in 2014—from innovations to capture and store carbon dioxide (CO_2) at coal-burning power plants, to improvement of the nation's power grid, to discovery of better ways to predict and prevent undersea oil leaks.

The report also summarizes the many patents and licenses issued to the Laboratory in 2014 as well as the special recognitions the Laboratory received over the past year.

I hope you enjoy this selection of NETL's 2014 accomplishments, and I look forward to an even more productive and successful year in 2015.

Dr. Grace Bochenek
Director, NETL

Building the World's Largest Post-combustion Carbon Capture Project in Texas

Ground was broken in 2014 on a retrofitting project, managed by NETL, which will allow a coal-fired power plant in Texas to capture 1.4 million tons of CO_2 that would otherwise be released into the air. Rather than building an entirely new facility, the Petra Nova project will apply carbon capture technology to an existing coal-fired power plant—helping to advance technologies that enable cleaner, safer, and more sustainable energy production from our abundant fossil energy resources.

Project sponsors NRG Energy Inc. and JX Nippon anticipate that, when completed, the project will capture the same amount of CO_2 as taking 250,000 cars off the road. Initially aimed to capture emissions from 60 megawatts of generation, the project was expanded to 240 megawatts. The project sponsors are enthusiastic about the technology and are considering additional retrofit projects.

Using a process previously tested in a 3-year pilot-scale test in Alabama, the project will capture 90 percent of the CO_2 from the portion of power plant flue gas being treated. The gas will then be compressed, dried, and transported to an oil field, where it will be injected to recover previously unreachable oil, and ultimately stored permanently underground. This project creates a path forward for existing coal-fired power plants to continue energy production while meeting environmental sustainability goals.

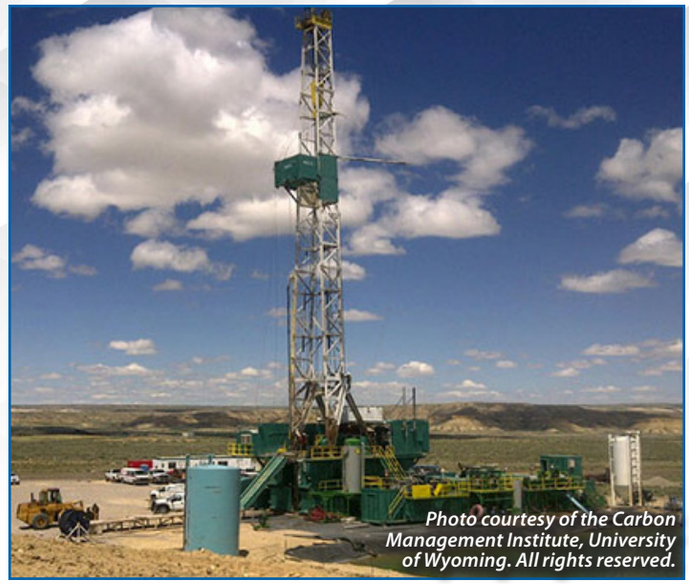


Photo courtesy of the Carbon Management Institute, University of Wyoming. All rights reserved.

Revealing Carbon Storage Potential in Wyoming

The Wyoming Rock Springs Uplift could potentially store 14 to 17 billion metric tons of CO_2, according to results from an NETL-sponsored study. This is equal to 250 to 300 years' worth of CO_2 emissions produced by Wyoming's coal-fired power plants and other large regional anthropogenic CO_2 sources at current emission levels.

The project team—led by the University of Wyoming's Carbon Management Institute—gathered geologic, hydrologic, and geochemical data from a 12,810-foot-deep stratigraphic test well that was drilled to evaluate the area's potential as a long-term, high-volume storage site for CO_2. The Rock Springs Uplift, a geologic feature in southwestern Wyoming, was found to have both the ideal geological characteristics for carbon storage and proximity to some of Wyoming's largest sources of anthropogenic CO_2 emissions.

This research effort, funded by the American Recovery and Reinvestment Act of 2009, will provide significant information to the National Carbon Sequestration Database and Geographic Information System (NATCARB), a geographic information system-based tool developed by NETL to provide a view of carbon capture and storage potential nationwide. The results could also lay the groundwork for a future large-scale carbon capture and storage project in Wyoming.

Achieving a Carbon Injection Milestone in Illinois

In 2014, the Illinois Basin-Decatur Project reached a major milestone by capturing 1 million metric tons of CO_2 and injecting it into a deep saline formation for permanent storage. Part of the development phase of the Regional Carbon Sequestration Partnerships initiative, the project is helping to develop and deploy carbon capture and storage (CCS) technologies, and move the United States toward a low carbon future.

The project captured CO_2 from the Archer Daniels Midland Company's ethanol production facility in Decatur, IL. It was then compressed and moved through a mile-long pipeline for injection 7,000 feet below the surface into the Mount Simon Sandstone formation. Over the course of 100 years, the injected CO_2 will remain far below a 300-foot thick shale formation that will act as a seal.

Since beginning in November 2011, the injection test performed better than expected, sustaining pressure increases well below regulatory limits.

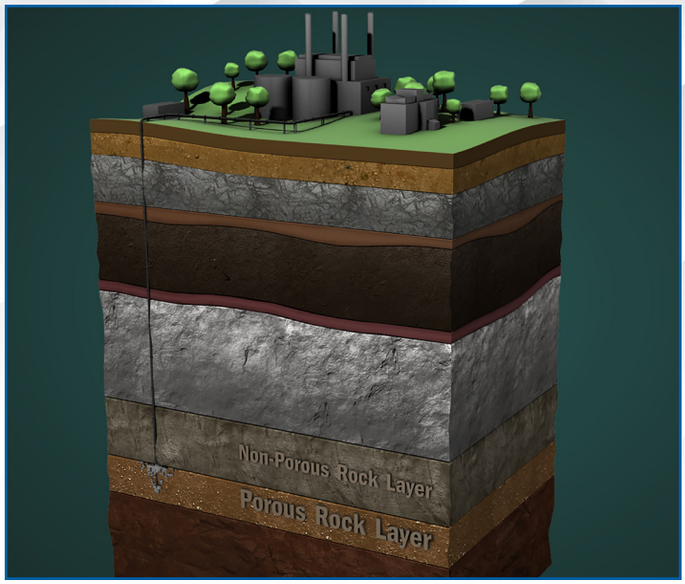
According to Energy Secretary Ernest Moniz, "This milestone is an important step toward the widespread deployment of carbon capture technologies in real-world settings."

Due to the project's success, infrastructure from the Illinois Basin-Decatur Project is also being integrated into an expanded, commercial-scale injection project funded by DOE.

Incorporating New Carbon Capture Technology into a Power Plant in Florida

In 2014, DOE officials joined RTI International and Tampa Electric Company (TECO) to celebrate the startup of a pilot project to scale up and demonstrate the integration of emerging warm gas cleanup and carbon capture technologies in a coal gasification unit at the Polk Power Station near Tampa, FL.

A product of DOE's Clean Coal Technology Demonstration Program, the Polk Power Station is a state-of-the-art integrated gasification combined cycle (IGCC) plant fueled with coal and petroleum coke blends. The IGCC converts coal and other solid fuels to syngas. Currently, this syngas is cleaned at IGCC power plants to remove contaminants such as CO_2, mercury, and sulfur with commercial technology that functions only at relatively low temperatures. IGCC technology augmented with RTI's emerging warm gas cleanup technology offers the potential to improve energy efficiency while simultaneously removing pollutants from coal power plant emissions. The process is expected to reduce the overall cost of capturing CO_2 and other contaminant emissions from power plants while also increasing reliability. The scale-up of RTI's warm gas cleanup technology at the TECO site is the first large-scale demonstration of such technology in an IGCC power plant.



Converting CO_2 into Commercial Products at a Plant in Texas

A major NETL-managed project demonstrating how CO_2 can be successfully captured and converted into commercial products was officially opened in October 2014. The project uses a first-of-its-kind process to capture an anticipated 75,000 tons of CO_2 from a San Antonio, TX, cement plant and then converts the greenhouse gas into useable products, including sodium carbonate and sodium bicarbonate. NETL worked with Skyonic Corporation on its SkyMine project that has already created more than 250 jobs during the construction period.

The $40 million DOE project was designed to retrofit existing coal-burning facilities but also has potential applications for heavy industry, including cement, glass, steel, and natural gas power. The byproducts produced through this process will offset other products with higher carbon footprints, and can be safely stored indefinitely. The company also plans on testing these products as a feedstock for algae-derived biofuels.

The technology builds upon several years of modeling, testing, and analysis performed by Skyonic and supported by DOE. The process will also remove most of the sulfur oxides, nitric oxides, mercury, and other heavy metals from the flue gas.

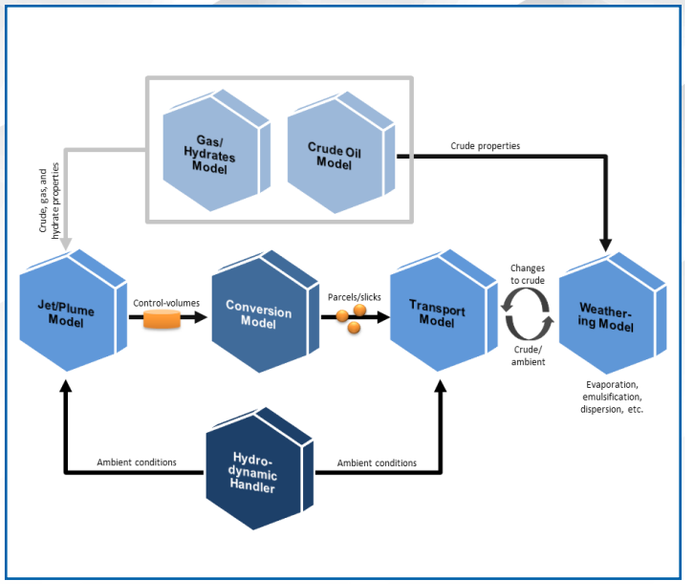
Testing Ways to Capture CO_2 from Plant Flue Gas in Alabama

Two 1-megawatt-electric (MWe) pilot plants designed for testing advanced technologies that economically capture CO_2 from flue gas were readied for online testing at the NETL-funded National Carbon Capture Center (NCCC) in Wilsonville, AL, during 2014.

Under a cooperative agreement with NETL, Linde LLC is operating a pilot plant expected to capture 30 tons of CO_2 per day. Testing at the pilot plant will validate performance on actual coal-derived flue gas of a CO_2-capture technology that integrates BASF's advanced aqueous amine-based solvent (OASE® blue) and process technology with Linde's novel CO_2-capture process and engineering innovations.

Small-business membrane manufacturer MTR Inc., under an American Recovery and Reinvestment Act-funded cooperative agreement with NETL, is operating its pilot plant on actual coal-derived flue gas following shakedown of the unit. MTR's CO_2 capture technology is the largest-scale CO_2 membrane technology in DOE's research portfolio.

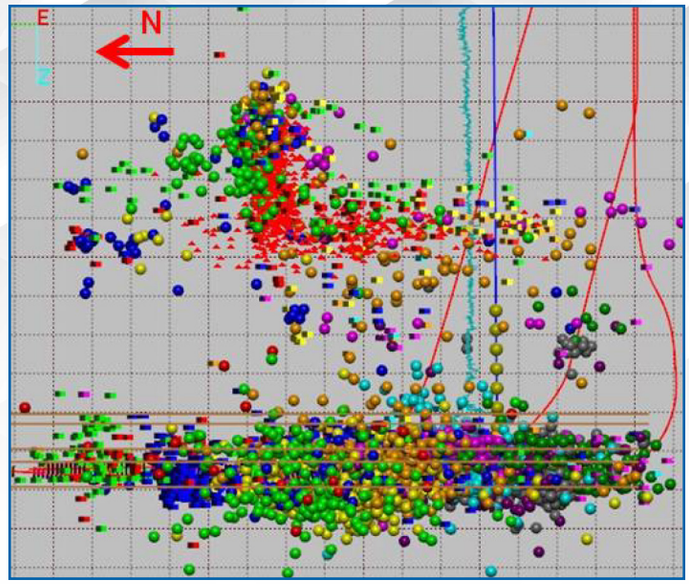
Also in 2014, DOE implemented a new 5-year cooperative agreement with Southern Company to evaluate advanced carbon-capture and gasification technologies at the NCCC. Under the agreement, which is managed by NETL, NCCC tests both pre- and post-combustion carbon capture technologies as well as materials and processes that support advanced fossil fuel conversion systems, primarily coal gasification. Technologies tested and demonstrated at the NCCC will accelerate the development and improve the performance of cost-effective carbon capture and gasification technologies.



Predicting and Preventing Oil Spills in the World's Oceans

A new modeling tool created by NETL scientists is helping to prevent future hydrocarbon leaks by providing a greater understanding of how hydrocarbon leaks from all sources are transported throughout offshore systems. The Blowout and Spill Occurrence Model, or BLOSOM, can rapidly simulate offshore spills and leaks in hypothetical, "what if" scenarios. The resulting data, combined with other tools in DOE's offshore hydrocarbon risk-assessment toolkit, can help prevent future incidents by identifying trends and pinpointing knowledge and technology gaps that contribute to a higher risk of spills. Currently, the Bureau of Safety and Environmental Enforcement is using BLOSOM to better understand worst-case discharge scenarios.

The new tool is part of DOE's integrated risk-assessment modeling effort of offshore hydrocarbon systems, which aims to reduce uncertainty and improve science-based decision-making for stakeholders involved in supplying safe and reliable domestic energy. BLOSOM was developed by NETL using lessons learned from the lab's response to hurricanes Katrina and Rita in the Gulf of Mexico and the 2010 Deepwater Horizon oil spill.

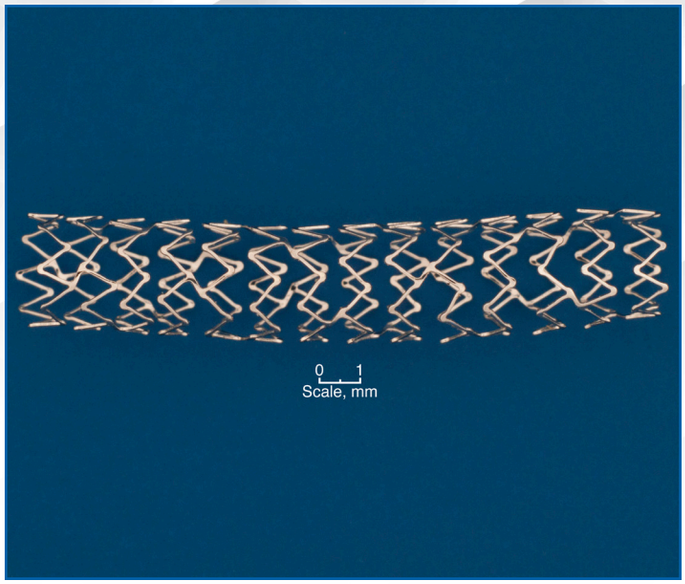


Studying Hydraulic Fracturing in Pennsylvania

NETL released a technical report on a limited field study that monitored a hydraulic fracturing operation in Greene County, PA, for upward fracture growth and upward gas and fluid migration. Results indicated that under the conditions of this study, for this specific location, fracture growth ceased more than 5,000 feet below drinking water aquifers and there was no detectable upward migration of gas or fluids from the hydraulically fractured Marcellus shale.

The study was led by NETL's Office of Research and Development and used natural and man-made tracers. The object was to learn if fluid and gas from hydraulically fractured Marcellus shale had migrated 3,800 feet upward to a gas-producing zone of Upper Devonian/ Lower Mississippian age shale, which was located midway between the Marcellus shale and the surface.

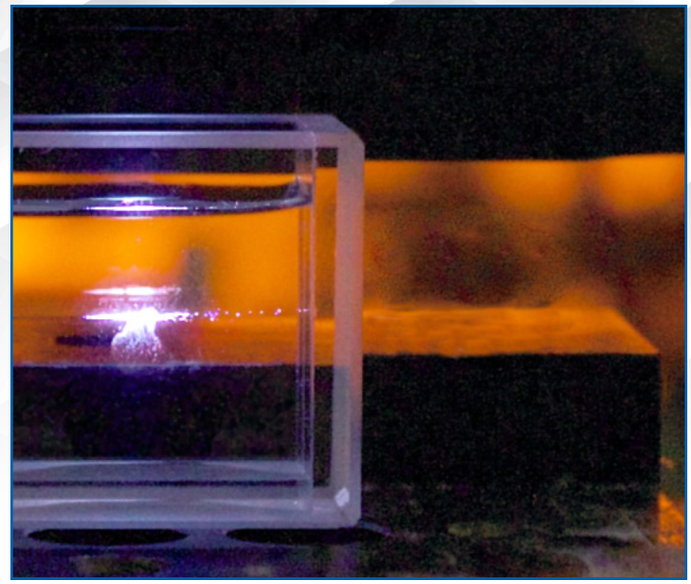
During hydraulic fracturing at the site, researchers detected microseismic signals using downhole geophones. All signals recorded were at least 2,000 feet beneath the Upper Devonian/Lower Mississippian gas field, and more than 5,000 feet below drinking water aquifers. Gas samples from the Upper Devonian/Lower Mississippian gas field were collected 2 months prior to hydraulic fracturing, and up to 8 months afterwards. No evidence of gas migration was detected.



Developing Material for Life-Saving Coronary Stents around the World

NETL scientists received the ASM Achievement Award for their work on development and commercialization of a novel platinum-chromium alloy used in next-generation coronary stents. ASM International is the world's largest association of metals-centric materials engineers, scientists, technicians, educators, and students.

The alloy, developed in collaboration with researchers at Boston Scientific Corporation, is the first stainless steel formulation for stents with a significant concentration of platinum, making it easier for coronary specialists to see the stent on x-rays during placement and expansion. The alloy also increases the stents' corrosive resistance, strength, and flexibility. Stents made from the alloy benefit patients by shortening recovery time and avoiding follow-on procedures and more invasive surgery, which reduces healthcare costs.

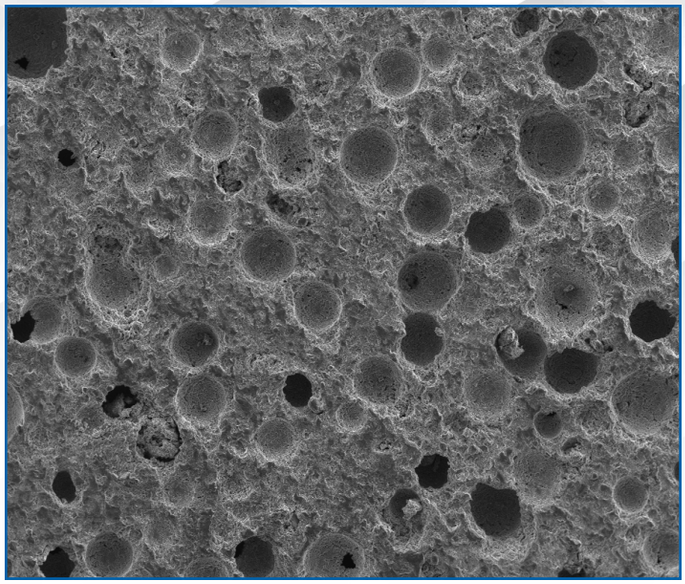


Using Lasers to Monitor Safe CO_2 Storage around the United States

An innovative monitoring technique developed by NETL researchers harnesses the power of lasers to monitor the safe and permanent underground storage of CO_2 from fossil fuel combustion in power plants.

Once captured from a power plant, CO_2 can be piped into underground geologic formations for permanent storage. NETL experts developed a technique, laser induced breakdown spectroscopy (LIBS), that can be used to validate that a storage site is not emitting CO_2, or provide early detection of leaks if they do occur. Early leak detection will enable site operators to implement a faster mitigation response to stop the leak. Laser technology is ideal for this application because it can analyze solids, liquids, and gases quickly from a distance at little expense.

NETL was awarded a patent in 2014 for "downhole laser sensing technology" that can be used at well sites to detect significant changes in ion concentration in groundwater over the course of CO_2 injection or other activities such as hydraulic fracturing. The technology has also attracted private industry attention and innovation awards, including the 2013 URS Pyramid Award and the 2013 Third Annual Energy and Innovation Conference Game Changer Award, in recognition of its potential for CO_2 monitoring.



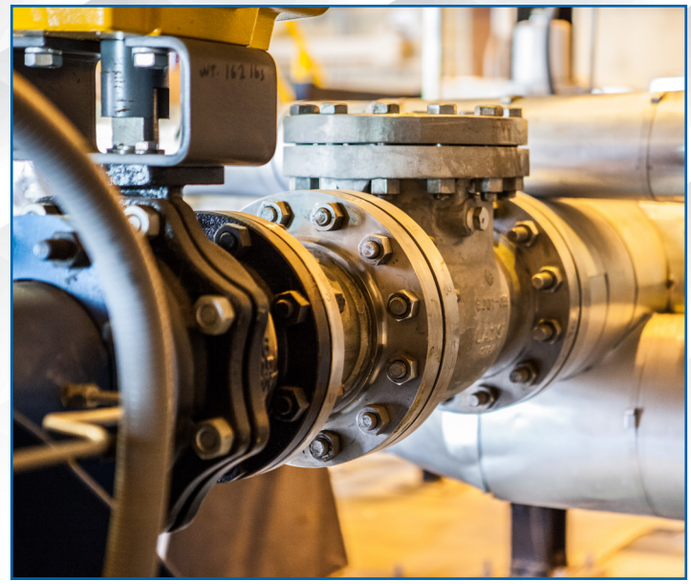
Creating Better Foamed Cement for Safer U.S. Oil and Gas Wells

In 2014, NETL researchers concluded a 3-year study that is producing more-effective foamed cement—an important product that is pumped down oil and gas wells to protect against leaks and spills. The work produced the first-ever high-resolution 3-D images of foamed cement for industry leaders to use in making safer wellbores.

Strength and stability of cement are critical in protecting the environment from leaks and spills wherever drills penetrate the earth in search of oil and gas on land or at sea. Foamed cement, created when gases like nitrogen are injected into cement slurry to form microscopic bubbles, is used in oil and gas wells because it performs better than conventional cement under high temperatures and pressures and provides a more reliable seal. But, the stability of foamed cement depends on the distribution and size of the gas bubbles, which vary depending upon how the cement is pumped and placed in each wellbore. Unstable foams can result in unprotected sections.

In a novel approach, NETL adapted medical diagnostic equipment—CT scanners—to generate data and 3-D images of cement containing various amounts of air or nitrogen at atmospheric and wellbore pressures. Researchers also used a scanning electron microscope to measure bubble sizes in the foamed cement.

NETL shares its research results across the globe through interactions with the American Petroleum Institute and partnerships with academia.



Extending Fuel Cells' Longevity for Hybrid Gas Turbine Systems across the Nation

NETL researchers discovered that applying an appropriate control strategy could dramatically extend the life expectancy of a solid oxide fuel cell (SOFC) by 10 times when coupled with a gas turbine in a hybrid configuration, compared to a standalone configuration. High SOFC replacement costs have stifled development of this ultra-efficient power generation technology, but this extended lifetime, as confirmed by NETL researchers, could position fuel cell-based systems to compete economically with other power generation technology. In addition, SOFC-based systems would offer higher efficiency and tremendously reduced emissions by as much as 90 percent.

Using NETL's Hybrid Performance (HyPer) project facility, researchers were able to simulate degradation in real time using novel advanced control systems. The HyPer facility dynamically coupled what researchers knew about fuel cell degradation and performance with turbine hardware by coupling the fuel cell responses from a real-time virtual fuel cell to the input of a physical, high-temperature gas turbine. The result is a real-time fuel cell model imbedded in the hardware of a hybrid power system.

This experimental work was published in the *Journal of Fuel Cell Science and Technology* (issue 11, volume 5; August 26, 2014). NETL's HyPer facility is a one-of-a-kind cyber-physical laboratory for studying hybrid power systems that couple distinct technologies such as fuel cells and turbines.

Photo courtesy of Alameda County (CA)

Demonstrating Microgrid-Improving Innovations in California

An NETL-managed project demonstrated in the nation's fifth largest jail showed how a microgrid—a small-scale power grid—can operate independently of, or in conjunction with, a main electrical grid to reduce energy consumption, saving more than $100,000 in electricity costs annually.

Chevron Energy Solutions installed the microgrid at the Santa Rita Jail in Dublin, CA, as part of DOE's Office of Electricity Delivery and Energy Reliability's Renewable and Distributed Systems Integration Program. The Santa Rita Jail microgrid incorporated a fuel cell capable of producing heat and power, a solar photovoltaic system, wind turbine generators, battery energy storage, backup diesel generators, and smart grid control features.

During the demonstration, it reduced the jail's peak power load by 95 percent and reduced energy consumption during peak hours by 98 percent while achieving an annual savings of $110,000 on electricity bills. Operation of the microgrid also reduced the load on the local distribution feeder serving the jail by about 15 percent, reducing wear-and-tear on substation equipment. The success of this project illustrates that large facilities are capable of nearly autonomous operation when microgrid technologies are employed.

Integrating Wind Power into the Power Grid in Texas

An innovative energy storage project in Texas managed by NETL is now demonstrating the effectiveness of using advanced lead–acid batteries to store power generated by a wind farm for more effective power grid management—solid progress in the nation's drive toward smart grid evolution.

The storage system in the Notrees Battery Project regulates frequency on the power line to ensure that a west Texas wind farm's naturally variable output does not destabilize the power grid. The storage system uses batteries to store energy generated by wind turbines, and then returns that energy back to the grid in brief bursts that are critical to maintaining grid stability. The project is helping expand the use of renewable energy with variable power generation, such as wind and solar, through efficient integration of alternative energy into the power grid.

The project is America's largest battery-storage project at a wind farm. NETL's Office of Energy Project Management oversees the project, as well as 31 other smart grid demonstration projects in support of DOE's Office of Electricity Delivery and Energy Reliability.

The 153 megawatt Notrees Wind Farm is owned and operated by Duke Energy (Charlotte, NC), which provides power to more than 7 million Americans across 8 states. The project will play a significant role in redefining the future of energy storage over the next 2 years of operation.

Reducing Emissions and Increasing Mileage for *Super Truck* Program on U.S. Roads

An NETL-managed research project under DOE's Super Truck program has successfully developed a long-haul freight vehicle capable of exceeding 10 mpg when fully loaded—a feat considered nearly impossible just a few years ago.

Prime contractor Cummins, along with its partners including Peterbilt, developed and demonstrated a highly efficient and clean diesel engine, an advanced waste heat recovery system, an aerodynamic tractor-trailer combination, and a lithium-ion battery auxiliary power unit to reduce engine idling.

The Cummins-Peterbilt Super Truck exceeded DOE goals for freight efficiency—a key trucking metric based on payload weight and fuel efficiency expressed in ton-miles per gallon. The Super Truck achieved an 86 percent improvement in freight efficiency and a 75 percent fuel economy improvement over a 24-hour test cycle. The program goal was a 68 percent freight-efficiency increase over a baseline vehicle of the same weight traveling along the same route.

The increase in fuel economy for the Cummins-Peterbilt Super Truck would save about $27,000 annually per truck based on today's diesel fuel prices for a long-haul truck traveling 120,000 miles per year. It would also translate into a more than 43 percent reduction in annual greenhouse gas emissions per truck. According to the American Trucking Associations, about 2 million registered tractor-trailers travel U.S. roads today.

Engaging America's Youth for Careers in Science, Technology, Engineering, and Math

The Federal Laboratory Consortium (FLC) awarded NETL's Dr. Kirk Gerdes and Ms. Lilas Soukup with a 2014 FLC Mid-Atlantic STEM Award for their outstanding efforts to engage America's youth in the disciplines of science, technology, engineering, and mathematics.

Since 2012, Dr. Gerdes has coordinated West Virginia Regional Science Bowl (WVSB), in which students contend in teams to answer STEM-focused questions. In 2014, Dr. Gerdes coordinated a partnership with West Virginia University that expanded the physical size of the WVSB venue, allowing the competition to include more high school teams and add 16 middle school teams. This partnership helps ensure the competition is accessible to all West Virginia high schools and strengthens NETL's STEM education outreach efforts.

Ms. Soukup leads NETL's K–12 educational outreach efforts, including teacher seminars, workshops, and hands-on training, which provide educators with resources to improve their skills in STEM fields. The award also recognizes Ms. Soukup's success in promoting science education directly to K–12 students. Ms. Soukup organizes Science Lab Days, Triple "E" Seminars (Energy, Environment, and Economics), and an annual Earth Day poster competition, and she has coordinated the Southwestern Pennsylvania Regional Science Bowl since 1991.

Securing Patents for Energy Innovation

Plasmonic Transparent Conducting Metal Oxide Nanoparticles and Nanoparticle Films for Optical Sensing Applications, **Paul Ohodnicki, Jr.** (DOE/NETL); **Mark A. Andio** (ORAU/ORISE); **Congjun Wang** (URS); 8,638,440, issued January 28, 2014.

Layered Solid Sorbents for Carbon Dioxide Capture, **George A. Richards, Henry W. Pennline, Daniel J. Fauth, McMahan L. Gray** (DOE/NETL); **Bingyun Li, Bingbing Jiang** (West Virginia University); 8,658,561, issued February 25, 2014.

Gas Sensing System Employing Raman Scattering, **Steven D. Woodruff** (DOE/NETL); **Joel Faulk, Peng Kevin Chen, Michael Paul Buric** (University of Pittsburgh); 8,674,306, issued March 18, 2014.

Basic Refractory and Slag Management for Petcoke Carbon Feedstock in Gasifiers, **Kyei-Sing Kwong, James P. Bennett** (DOE/NETL); **Jinichiro Nakano** (URS); 8,703,021, issued April 22, 2014.

Nanocomposite Thin Films for Optical Gas Sensing, **Thomas Brown, Paul Ohodnicki, Jr.** (DOE/NETL); 8,741,657, issued June 3, 2014.

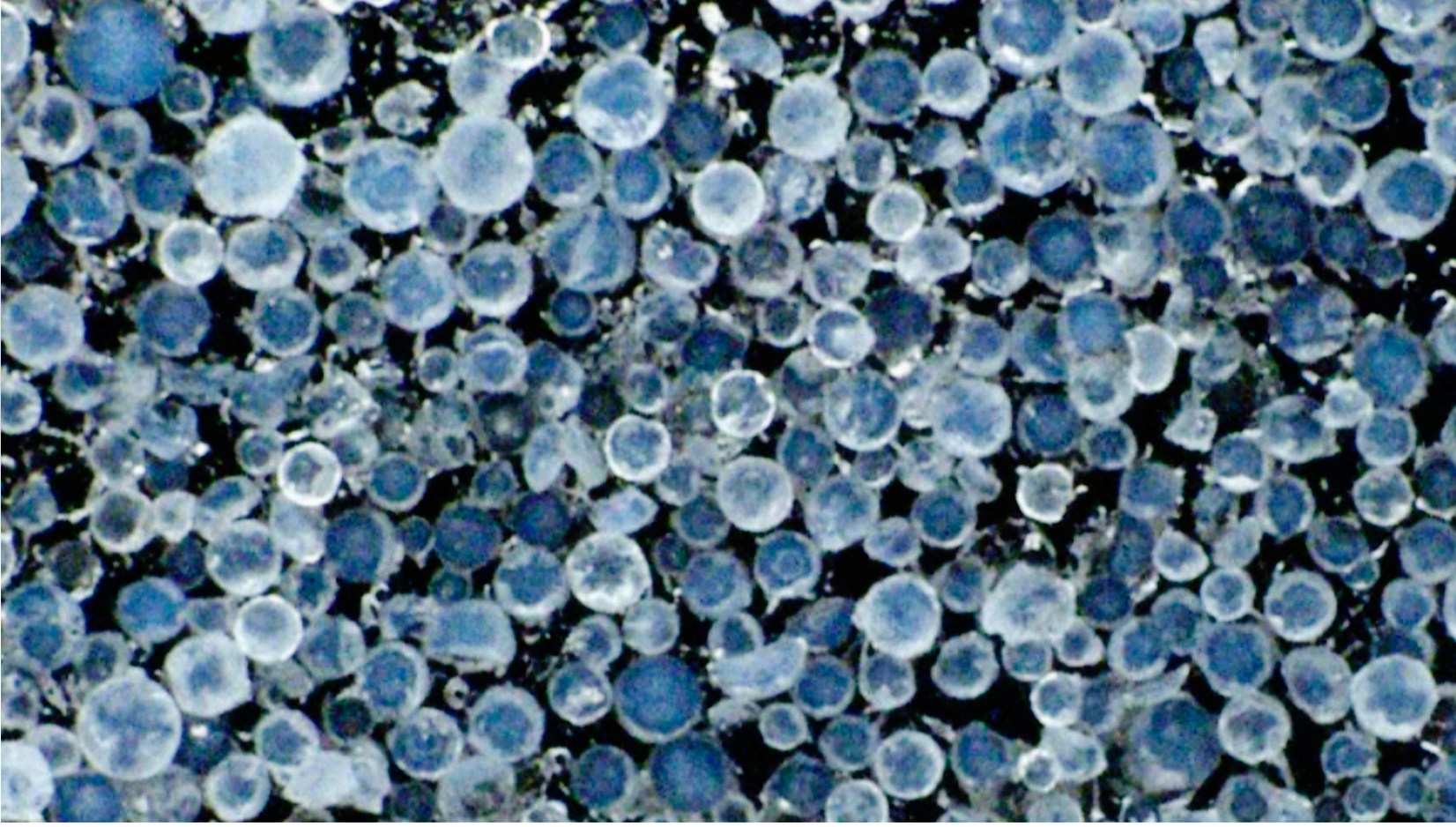
Apparatus and Process for the Separation of Gases Using Supersonic Expansion and Oblique Wave Compression, **John G. VanOsdol** (DOE/NETL); 8,771,401, issued July 8, 2014.

A Method and Device for Remotely Monitoring an Area Using a Low Peak Power Optical Pump, **Steven D. Woodruff, Dustin McIntyre** (DOE/NETL); **Jinesh Jain** (URS); 8,786,840, issued July 22, 2014.

Solid Oxide Fuel Cells Having Porous Cathodes Infiltrated with Oxygen-Reducing Catalysts, **Wayne Surdoval** (DOE/NETL); **Meilin Liu, Mingfei Liu, Lifang Nie** (GTECH); **Ze Liu, David Mebane** (ORISE); **Lane C. Wilson** (DOE/HQ); 8,802,316, issued August 12, 2014.

Regenerable MgO Promoted Metal Oxide Oxygen Carriers for Chemical Looping Combustion, **Ranjani V. Siriwardane** (DOE/NETL); **Duane D. Miller** (URS); 8,807,988, issued August 19, 2014.

Constant Pressure High Throughput Membrane Permeation Testing System, **David Luebke, David Hopkinson** (DOE/NETL); **Erik Albenze** (URS); 8,821,614, issued September 2, 2014.



Electrically Conducting Metal Oxide Nanoparticles and Films for Optical Sensing Applications, **Paul Ohodnicki, Jr.** (DOE/NETL); **Mark A. Andio** (ORAU/ORISE); **Congjun Wang** (URS); 8,836,945, issued September 16, 2014.

Regenerable Immobilized Aminosilane Sorbents for Carbon Dioxide Capture Applications, **McMahan L. Gray** (DOE/NETL); **Christopher Jones, Sunho Chai** (GTECH); 8,834,822, issued September 16, 2014.

Layered Solid Sorbents for Carbon Dioxide Capture, **Daniel J. Fauth, George A. Richards, Henry W. Pennline, McMahan L. Gray** (DOE/NETL); **Bingbing Jiang, Bingyun Li** (West Virginia University); 8,889,589, issued November 18, 2014.

Method of CO_2 Removal from a Gaseous Stream at Reduced Temperature, **Ranjani V. Siriwardane, George A. Richards, David A. Berry** (DOE/NETL); **James C. Fisher, II** (URS); 8,888,895, issued November 18, 2014.

Method of Purifying a Gas Stream Using 1,2,3-Triazolium Ionic Liquids, **David Luebke** (DOE/NETL); **Chau Tang, Hunaid Nulwala** (ORISE); 8,906,135, issued December 9, 2014.

1,2,3-Triazolium Ionic Liquids, **David R. Luebke** (DOE/NETL); **Hunaid Nulwala, Chau Tang** (ORISE); 8,907,105, issued December 9, 2014.

Poly (Hydroxyl Urethane) Compositions and Methods of Making and Using the Same, **David R. Luebke** (DOE/NETL); **Hunaid Nulwala** (ORISE); **Chau Tang** (ORISE); 8,912,303, issued December 16, 2014.

Production of Methane-Rich Syngas from Hydrocarbon Fuels Using Multifunctional Catalyst/Capture Agent, **David A. Berry, Dushyant Shekhawat, Wayne Surdoval, Nicholas Siefert** (DOE/NETL); 8,920,526, issued December 30, 2014.

Licensing New Inventions for the Commercial Market

Santa Catarina Philanthropic Association/Brazil Coal Association, license for Carbon Capture Simulation Initiative (CCSI) Moving Bed Process Model to Develop Carbon Capture Technology, issued July 24, 2014.

Issued to Michael Berry, non-exclusive license for U.S. Patent 7,553,517, *Method of Applying a Cerium Diffusion Coating to a Metallic Alloy.*

Attracting Awards and Special Recognitions for Energy Innovations

American Institute of Chemical Engineers (AIChE)—a nonprofit organization providing leadership to the chemical engineering profession representing 45,000 members from over 100 countries in industry, academia, and government.

- **Isaac Gamwo** was elected as an AIChE Fellow. The honor is bestowed to AIChE chemical engineers in recognition of long-term "service to the profession" and "significant professional accomplishment."

ASM International—the world's largest association of metals-centric materials scientists and engineers with more than 30,000 members worldwide.

- **Jeffrey Hawk, Paul Jablonski, Paul Turner,** and **Edward Argetsinger** were awarded the Engineering Materials Achievement Award by ASM in 2014 for their work in developing the platinum-chromium alloy for coronary stents. The award recognizes outstanding developments in the application of materials in products or in engineering structures and honors the organization or individuals responsible for them.

Federal Laboratory Consortium (FLC)—a nationwide network of federal laboratories that provides the forum to develop strategies and opportunities for linking laboratory mission, technologies, and expertise with the marketplace. Its awards recognize federal laboratories and industry partners for outstanding technology transfer efforts.

- In the FLC Far West Region—

  Paul King and **Rigel Woodside** received the Outstanding Technology Development Award for their work, "Arc Position Sensing Technology."

  Paul Jablonski and **Jeffrey Hawk** received the Outstanding Technology Development Award for their work, "Superior Heat Resistant Alloys through Controlled Homogenization."

- In the FLC Mid-Atlantic Region—

  Stephen Zitney received the Excellence in Technology Transfer Award for his work "3-D Virtual Energy Plant Simulator and Immersive Training System."

National Association of Government Communicators (NAGC)—a professional network of federal, state, and local government communicators. Its Blue Pencil and Gold Screen Awards recognize government agencies or individuals for significant achievement in communication. NETL won Blue Pencil and Gold Screen Awards for two publications.

- The NETL-RUA brochure, "Engineering the Future of Energy"

- A nationally distributed article in *ECO Magazine*, "Ultra-deepwater Research at DOE: Protecting Our Environment through Risk Assessment and Spill Prevention"

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