

FOSSIL ENERGY TODAY

A Newsletter
About Innovative
Technologies
for Fossil Energy



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NATIONAL SEQUESTRATION EDUCATION CENTER OPENS IN ILLINOIS

Offers the Nation's First Associate Degree in CCUS

This September marked a major milestone for one of the Office of Fossil Energy's largest carbon capture, utilization and storage projects: the opening of the National Sequestration Education Center (NSEC) in Decatur, Illinois.

The education center – part of the larger industrial carbon capture and storage (CCS) project led by Archer Daniels Midland – will be the first in the nation to offer students a chance to earn an associate's degree in carbon capture, utilization, and storage (CCUS) — the process of

capturing and storing or re-using carbon dioxide (CO₂) from coal-fired power plants and industrial sources.

The NSEC is a 15,000 square-foot sustainably-designed center that will contain classrooms, and training and laboratory facilities. It will also include renewable energy features such as wind turbine, solar, geothermal, and

The Illinois ICCS project held a ribbon cutting ceremony on September 19, 2012, to inaugurate the National Sequestration Education Center at Richland Community College and to celebrate project milestones, including: completion of the mechanical installation of the compression and dehydration equipment, and initiating monitoring well construction related to deep underground carbon storage facilities.

biomass technology. The center is located at Richland Community College.

With CO₂ injection monitoring instruments networked into the NSEC, students will gain first-hand experience with the sequestration technologies demonstrated by the project partners and others.

Beginning this fall, Richland will offer an Associate of Applied Science degree in Engineering Technology with Sequestration Specialty.

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Photo Courtesy of Richland Community College.

Illinois ICCS project partners at the inauguration of the National Sequestration Education Center.

(L to R): Scott McDonald (Archer Daniels Midland Company), Dwight Peters (Schlumberger Carbon Services), Dr. Gayle Saunders and Dr. Douglas Brauer (Richland Community College), Dr. Robert Finley (Illinois State Geological Survey), Dr. Sai Gollakota, Michael Knaggs, and Thomas Sarkus (National Energy Technology Laboratory, U.S. Department of Energy).

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ENVIRONMENT, SECURITY, SAFETY AND HEALTH: VITAL IN HELPING FE ACHIEVE ITS MISSION

by Mark Matarrese

Maybe we don't think about it often, but everyone can relate to the need for high levels of safety, security and health practices in our daily lives. Whether painting a fence, cooking a meal, enjoying a vacation, running in a marathon, or even accomplishing more routine activities, there is nothing more important than completing the task in a way that is not only efficient and satisfying, but also safe and secure.

It stands to reason that this need also applies to the workplace, where achieving it may even be more challenging and vital to personal well-being. Making sure the Office of Fossil Energy does its best to eliminate injuries and accidents, promote worker safety awareness, ensure management and employee accountability, and attain workplace security, environmental protection and sustainability are the primary responsibilities of the department I direct – the Office of Environment, Security, Safety and Health (ESS&H).

In essence, the safety part of our duties refers to procedures, actions and programs that help keep workers from being injured or getting sick. Security overlaps safety somewhat in that it can also mean shielding FE workers from harm or illness – but it has broader aspects as well, such as ensuring protection of facilities and infrastructure, and that strong emergency preparedness and response programs are in place. Environmental concerns include not only assuring FE compliance with external requirements, but also managing sustainability initiatives and assuring a healthy internal working environment that promotes worker productivity and efficiency.

One way we have built a culture of safety is to ensure employees have the training, support and resources needed to reduce workplace accidents and injuries. We designed, developed and implemented a high profile program – the “Heroes for Zero” Campaign – to promote employee awareness of personal responsibility in safety matters, as well as to foster a philosophy of high safety standards across all FE programs through enhanced education and training. The campaign's stringent “zero” goal is a recognition that even a single workplace accident/injury is one too many. Is it achievable? FE's Rocky Mountain Oilfield Testing Center (RMOTC) has already notched two straight quarters in a row with zero accidents and all other departmental branches are striving to meet the goal.

In the environmental area, several years ago ESS&H took on the responsibility for managing the quality assurance, preparation and final distribution of Fossil Energy National Environmental Policy Act (NEPA) documents for Federal Register publication and distribution to congressional, state and tribal stakeholders. This included document management for statutory requirements, such as Notices of Intent, Draft Environmental Impact Statements, Final Environmental Impact Statements, and Records of Decision for FE's NEPA projects. By taking on this responsibility, ESS&H streamlined the NEPA process and in a timely and efficient manner loosened the bottleneck for managing major projects.

Regarding environmental sustainability, the challenge is to move FE's program execution toward a sustainable future, such as increasing energy efficiency, reducing water consumption and potentially harmful emissions, incorporating renewable energy and conservation into facilities and operations, and similar initiatives. In 2011, we launched the quarterly *Sustainability Pipeline Newsletter*, focusing on FE sustainability efforts and success stories. Featured in a recent issue was FE's National Energy Technology Laboratory (NETL), which won three sustainability awards and utilized best management practices whose results not only met or exceeded DOE conservation goals, but also displayed the potential to be replicated anywhere in the federal government or private sector.

In the final analysis, what we do at ESS&H is ultimately essential to FE achieving its mission of helping America take full advantage of its fossil energy resources in an efficient, cost-effective and environmentally sustainable manner. Over the years the challenges have changed – today, with smaller budgets and fewer resources, maintaining high levels of workplace safety, security, health and environmental standards is more difficult and complex. Rapid advances in cyber technology and sophisticated homeland security threats have increased needs in these areas. An aging workforce and older infrastructure also pose significant considerations. But ESS&H's commitment to attaining its goals, objectives and mission remains unaltered.

For more information on our program, I invite readers to access our flagship publication, the *Fossil Energy Annual ESS&H and Sustainability Report*, available at: <http://www.fe.doe.gov/aboutus/esh/FE-ESSH-Annual-Report-2010-FINAL.pdf>.



Mark Matarrese is the Director of Environment, Security, Safety and Health.

“NSEC” continued from page 1...

The college plans to offer an Associate of Science degree with Sequestration Concentration, a university transfer degree, in the fall of 2013.

Public education and outreach on CCUS is an integral part of this ICCS project. Richland Community College recently launched a public website – <http://nsec.richland.edu> – to help educate the public on CCUS activities. The NSEC will also provide community and regional outreach through its state-of-the-art interactive visitor’s center and will offer workforce development for CCUS industries and facilitate ongoing professional development.

The NSEC is a part of the Illinois Industrial Carbon Capture and Storage project. This project, supported by the Office of Fossil Energy, is led by Archer Daniels Midland, in partnership with Schlumberger Carbon Services, University of Illinois-Illinois State Geological Survey and Richland Community College. With more than \$141 million in funding from the 2009 Recovery Act and nearly \$67 million from the private sector, the ICCS project will integrate the nearby Illinois Basin Decatur Project’s CO₂ processing facilities with new facilities to inject and safely store 1 million tons of CO₂ per year. When operations begin in 2013, the CO₂ will be captured from ADM’s ethanol plant in Decatur. From there, it will be transported via a mile-long pipeline and injected deep underground into the Mt. Simon Sandstone saline reservoir. The reservoir has an estimated CO₂ storage capacity of as much as 151 billion metric tons.

Learn more about this project at http://www.netl.doe.gov/technologies/coalpower/cctc/iccs1/bibliography/iccs_archer.html.

SECOND PHASE OF INNOVATIVE TECHNOLOGY PROJECT TO CAPTURE CO₂, PRODUCE BIOFUELS, LAUNCHED IN OHIO

DOE-funded Process Could Eventually Help Reduce Greenhouse Gases

A novel method to capture carbon dioxide (CO₂) from flue gas and produce biofuels has been formally launched in the second phase of a Department of Energy project at a nursery in Ohio. Successful application of the process could eventually help reduce greenhouse gas emissions and provide a source of liquid biofuels and biogas, reducing U.S. dependence on foreign energy sources.

Touchstone Research Laboratory in Triadelphia, W.Va., successfully inoculated four biomass production ponds with algae at Cedar Lane Farms in Wooster, Ohio, and is now investigating the effectiveness of an innovative phase change material to enhance open pond algae production.

An event celebrating the formal launch of the bioconversion pilot plant was hosted by Touchstone at Cedar Lane Farms on Wednesday, July 25. The event, which included a tour of the facility, was attended by Mayor Bob Brenneman of Wooster, Ohio; representatives from the offices of U.S. Congressman Jim Renacci (R-Ohio) and U.S. Senator Sherrod Brown (D-Ohio); and other local dignitaries, business development personnel, and project team members. In addition to the Ohio Agricultural Research and Development Center, Touchstone’s partners for this project include GZA GeoEnvironmental (Cincinnati, Ohio) and OpenAlgae LLC (Austin, Texas).

The project consists of several indoor and outdoor ponds which are being used to determine how Touchstone’s phase-change material tackles three challenges inherent in algae biofuels production: maintaining temperature, minimizing water evaporation, and protecting against invasive species. The phase-change material absorbs infrared solar radiation during the day as latent heat and releases it to the water at night when temperatures drop. Covering the surface of the pond, the material regulates daily temperature fluctuations, reduces water loss from evaporation, and helps control the growth of invasive species.

Touchstone will operate the new system for approximately 14 months and gather data to substantiate future commercialization efforts. Once the algae ponds have matured, the algal biomass will be harvested and processed to collect the lipids. Roughly 2,000 gallons of algal oil will be recovered from the process per year and upgraded to renewable biofuel. The Ohio State University’s Ohio Agricultural Research Development Center will perform pilot-scale process development and testing of an anaerobic digestion process to convert the residual algae biomass to methane.

Learn more about this project at: <http://www.netl.doe.gov/publications/factsheets/project/FE0002546.pdf>.

AVESTAR CENTER DEPLOYS 3-D VIRTUAL TRAINING SYSTEM

Successful Site Acceptance Testing Allows NETL to Improve Coal-Fired Power Plants

The National Energy Technology Laboratory's AVESTAR™ Center has taken a major step forward with the successful deployment and site acceptance testing of a new 3-D virtual immersive training system for integrated gasification combined cycle (IGCC) power plants



AVESTAR's new 3-D virtual immersive training system shows a simulated gas leak at a power plant.

with carbon capture. The training center, launched in 2011, continues to build its portfolio of dynamic simulators, virtual plant technologies, and advanced research capabilities to satisfy industry's growing need for training and experience in the operation and control of high-efficiency, near-zero-emissions energy plants.

The AVESTAR (Advanced Virtual Energy Simulation Training and Research) team — which includes NETL, Invensys Operations Management, West Virginia University, and Fossil Consulting Services — installed and tested the training system hardware in July 2012. Included are an instructor station computer, two field operator station computers, 3-D projectors, 3-D LCD screens, and a head-mounted 3-D visor for viewing a virtual IGCC plant. Wearing the head-mounted visor or wireless 3-D video glasses, users can interact with IGCC plant equipment in real-time, activate transparent views of equipment internals, display pop-up trends of key process variables, and experience equipment sound effects, malfunctions, and visual training scenarios.

Training field operators is becoming more and more important as complex IGCC power plants become a reality. The 3-D immersive training system deployed by Invensys is the first of its kind to address those needs on an industrial scale. Combining the immersive 3-D virtual plant environment with AVESTAR's existing high-fidelity, real-time IGCC dynamic simulator allows control room and field operators to coordinate their actions and work together as a team. Additional benefits include collaborative training for safety-critical tasks, rare occurrences, and emergency shutdowns. Aside from training and research applications, NETL and its AVESTAR partners use these realistic, hands-on systems to showcase clean coal technologies that support a clean energy future.

Learn more about AVESTAR at <http://www.netl.doe.gov/avestar/>.

TRAINING OF BRAZIL'S PETROBRAS ADVANCES GOAL OF DEPLOYING CLEAN COAL TECHNOLOGY AT HOME AND ABROAD

A recently-completed comprehensive training initiative using an innovative high-fidelity combined-cycle dynamic simulator has provided employees of a Brazilian multi-national company the opportunity to learn to operate and control the near-zero-emission power plants critical to a cleaner energy future.

The 8-day course for power plant operators from Petrobras used the NETL-sponsored AVESTAR Center. However, the program's workforce training, engineering education, and advanced research programs are not geographically limited. NETL's AVESTAR Center partners — Fossil Consulting Services and Invensys Operations Management (IOM) — delivered the Petrobras training to 10 experienced operators after installing the simulator software on computers in IOM's office in São Paulo, Brazil.

The training covered the fundamentals and operation of all major combined-cycle systems, including gas and steam turbines; condensate, feed water, and circulating water systems; heat recovery steam generators; and sulfur recovery units. Experiential learning scenarios emphasized baseload plant operations along with startup from cold metal to full load. The trainees also performed a normal plant shutdown to hot boiler condition in preparation for a subsequent startup, and they participated in a full day of plant malfunction training.

Learn more about this training at http://www.fossil.energy.gov/news/techlines/2012/12045-DOE_Simulator_Training_to_Brazil.html.

FE TEAMS EARN SECRETARY OF ENERGY ACHIEVEMENT AWARDS

Secretary of Energy Steven Chu honored two Office of Fossil Energy groups – the National Energy Technology Laboratory’s Coronary Stents Team and the Strategic Petroleum Reserve’s (SPR) 2011 Drawdown Team – with Secretary of Energy Achievement Awards for exceptional performance in carrying out the Department’s mission.

The NETL team was honored for work in formulating a unique platinum-chromium alloy used for new generation coronary stents, which are used to successfully treat patients with coronary artery disease. The NETL team, comprising Paul Turner, Paul Jablonski, and Ed Argetsinger, jointly developed the alloy with Boston Scientific Corporation Inc. Stents made with the alloy are stronger, thinner, more flexible, and easier to see on x-ray than previous stainless stents. This results in easier placement by the doctor and greater patient safety.

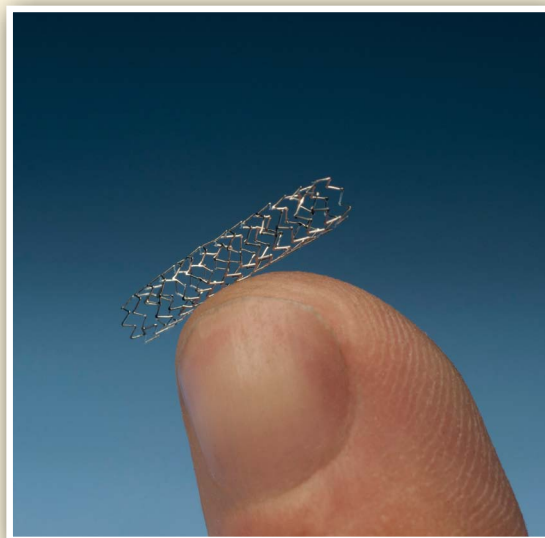
The stents are so superior to older models that they have quickly captured nearly half of the U.S. market and a third of the market worldwide, with sales of more than \$4 billion. Recently, a stent using this alloy was approved in Europe to treat obstructed blood flow in the arms and legs, and it is expected that these same stents will be approved for use in the United States in the next few months.

In 2011, the new alloy captured two prestigious awards: an R&D 100 Award, given by R&D Magazine to recognize the 100 most technologically significant products entering the marketplace each year, and a technology transfer award for “Outstanding Commercialization Success” from the Federal Laboratory Consortium for Technology Transfer.

The SPR team was recognized for exceptional performance in the successful sale, drawdown and delivery of 30 million barrels of crude oil, efficiently executing a Presidential drawdown order.



With a capacity of 727-million-barrels, the U.S. Strategic Petroleum Reserve is the largest stockpile of government-owned emergency crude oil in the world.



Small coronary stents made with a unique platinum-chromium alloy developed by NETL and Boston Scientific can open blocked arteries and save lives.

The SPR team took action after President Obama ordered a drawdown of the reserve to join the International Energy Agency’s collective response to the shutdown of Libya’s oil industry. The 2011 drawdown was the largest emergency release of SPR petroleum stocks ever accomplished and was completed on time and without any accidents, environmental incidents, or delivery problems.

Comprising the SPR team were: Jorge Aguinaga, Racheal P. Baldwin, Lansen C. Barrow, Michael Corule, Gary F. Durel, Patricia C. Ehrle, Julianna R. Gallego, Kelley M. Gele, Lionel J. Gele, Jr., William C. Gibson, Jr., Ralph R. Habbaz, Nathan T. Harvey, Marshall B. Jackson, David F. Johnson, Robert J. Kahl III, Allison W. Kuhn, Nancy T. Marland, Michael E. McWilliams, Lindsay Partusch-Goldstein, Anthony Earl Pate, John M. Powell, Anne M. Quern, James M. Quern, Grant G. Rivera, Suresh M. Sevak, Nabil A. Shourbaji, George R. Shutt, and Sheldra A. Wormhoudt.

DOE received more than 55 nominations for the Secretary’s Honor Awards this year. In what was called “the most comprehensive review process to date,” a DOE panel narrowed the list to the most significant of accomplishments and delivered recommendations to Secretary of Energy Steven Chu for final selections. A total of 11 teams were selected for Achievement Awards. The Honor Awards are the highest internal non-monetary recognition that DOE employees can receive.

PROJECT SELECTIONS ANNOUNCED

The Office of Fossil Energy recently announced the selection of projects in several different areas over the last quarter. Below is a synopsis of those selections.

Advanced Oxy-Combustion

The Energy Department's \$7 million investment - leveraged with recipient cost-share to support approximately \$9.4 million in total projects - will support the development and deployment of carbon capture, utilization, and storage (CCUS) by focusing on further improving the efficiency and reducing the costs associated with carbon capture.

These selections are part of a two-phase effort to evaluate and develop advanced oxy-combustion projects that yield cost-competitive options for CCUS. These projects will aim to achieve at least 90 percent carbon dioxide removal while delivering carbon dioxide at a capture cost of less than \$25 per ton.

- Alstom Power (Windsor, Conn.)
- Babcock & Wilcox Power Generation Group (Barberton, Ohio)
- Gas Technology Institute (Des Plaines, Ill.)
- Pratt & Whitney Rocketdyne (Canoga Park, Calif.)
- Southwest Research Institute (San Antonio, Texas)
- Unity Power Alliance (Worcester, Mass.)
- University of Kentucky Research Foundation (Lexington, Ky.)
- Washington University (St. Louis, Mo.)

To learn more about these selections, visit: http://www.fossil.energy.gov/news/techlines/2012/12033-DOE_Announces_Oxycombustion_Projec.html.

Solid oxide fuel cell technology

These projects will develop solutions to current technical challenges consistent with the aggressive cost, reliability and endurance goals of the Solid State Energy Conversion Alliance (SECA). The ultimate goal is the generation of efficient, cost-competitive electricity from domestic coal with near-zero emissions of carbon dioxide and air pollutants.

The projects, managed by the National Energy Technology Laboratory, are valued at a total of \$4,391,570, with DOE contributing \$3,499,250 and the remaining cost provided by the recipients. Four of the selected projects will pursue advances in cathode performance, enabling higher efficiency, lower cost systems. Three projects will study the stability and durability of cathode materials when exposed to varying levels of humidity and contaminants expected in commercial deployment.

Topic Area 1: Electrochemical Performance Enhancement Activity

- Boston University (Boston, Mass.)
- Stanford University (Stanford, Calif.)
- University of Wisconsin (Madison, Wis.)
- West Virginia University (Morgantown, W.Va.)

Topic Area 2: Durability of Cathode Materials

- Georgia Tech Research Corporation (Atlanta, Ga.)
- University of Connecticut (Storrs, Conn.)
- University of Maryland (College Park, Md.)

To learn more about these selections, visit: http://www.fossil.energy.gov/news/techlines/2012/12034-DOE_Selects_Fuel_Cell_Projects.html.

Methane Hydrates

The Energy Department announced the selection of 14 new research projects across 11 states that will be a part of an expanding portfolio of projects designed to increase our understanding of methane hydrates' potential as a future energy supply. Methane hydrates are 3-D ice-lattice structures with natural gas locked inside, and are found both onshore and offshore – including under the Arctic permafrost and in ocean sediments along nearly every continental shelf in the world.

These new projects will focus research on field programs for deepwater hydrate characterization, the response of methane hydrate systems to changing climates, and advances in the understanding of gas-hydrate-bearing deposits.

Characterizing the Affect of Environmental Change on Gas-Hydrate-Bearing Deposits

- The University of California at San Diego (San Diego, Calif.)
- The University of Mississippi (Oxford, Miss.)
- University of New Hampshire (Durham, N.H.)
- Oregon State University (Corvallis, Ore.)
- Southern Methodist University (Dallas, Texas)
- The University of Texas at Austin (Austin, Texas)

- Fugro GeoConsulting, Inc. (Houston, Texas)

Fundamental Properties of Gas Hydrate-bearing Sediments

- Colorado School of Mines (Golden, Colo.)
- Georgia Tech Research Corporation (Atlanta, Ga.)
- Wayne State University (Detroit, Mich.)

Marine Gas Hydrate Characterization

- Consortium for Ocean Leadership (Washington, D.C.)
- Fugro GeoConsulting, Inc. (Houston, Texas)
- The Ohio State University (Columbus, Ohio)
- Oklahoma State University (Stillwater, Okla.)

To learn more about these selections, visit: http://www.fossil.energy.gov/news/techlines/2012/12040-Methane_Hydrate_Research_Advances.html.

NETL CAPTURES SUSTAINABILITY AWARDS

Lab Recognized for Exceptional Service, Environmental Management, Water Initiatives

The DOE Sustainability Awards program, now in its second year, "recognizes the achievements of DOE employees whose leadership and cost-reducing initiatives have saved taxpayer money by reducing the Department's use of energy, water, and paper while improving the energy efficiency of Federal buildings and vehicles." This year, 137 nominations were received and 20 awards were given in 14 categories.

NETL's Gregg Sawl was recognized as an Exceptional Service/Sustainability Champion by demonstrating "exceptional service and dedication" in his role as NETL's Energy Manager. His commitment to sustainability was evidenced in a variety of new construction projects and energy management initiatives, and through renovations to meet federal guidelines for high-performance and sustainable buildings. Among the many achievements under Sawl's leadership, NETL was able to reduce the energy intensity of its buildings by 23 percent from 2003 to 2011.

In the Environmental Management System category, NETL's EMS/Sustainability Team earned an award by implementing and reaching goals within its own environmental management system — which is integrated with DOE's Integrated Safety Management System — while conforming to the International Organization for Standardization 14000 series. Along with other accomplishments, from 2008 to 2011, NETL reduced routine nonhazardous waste by 15 percent, hazardous waste by 30 percent, and direct and indirect greenhouse gas emissions by 13 percent.

NETL's Site Operations Division earned a Water Resources award by exceeding the 2020 water intensity reduction goal of 26 percent, set forth in Executive Order 13514, in 2011 — 9 years ahead of schedule. The laboratory's water intensity was slashed 44 percent, compared to the baseline year of 2007, through site-wide reductions in potable water usage, incorporation of closed-loop cooling systems, development of rainwater harvesting systems, and other initiatives.

Learn more about the federal government's efforts to reduce energy consumption and work in a more sustainable environment across the government at <http://www.ofee.gov/>.



(L-R) Gregg Sawl and Allen Lichvar both from NETL with Chad Bourgoin and Mark Matarrese from ESS&H.

VAST ENERGY RESOURCE IN RESIDUAL OIL ZONES, STUDY SAYS

Billions of barrels of oil that could increase domestic supply, help reduce imports, and increase U.S. energy security may be potentially recoverable from residual oil zones, according to initial findings from a study supported by the Office of Fossil Energy. The recently completed study, conducted by researchers at the University of Texas–Permian Basin (UTPB), is one of several FE-supported research projects providing insight that will help tap this valuable-but-overlooked resource.

Residual oil zones, called ROZs, are areas of immobile oil found below the oil-water contact of a reservoir. ROZs are similar to reservoirs in the mature stage of "waterflooding," in which water has been injected into a formation to sweep oil toward a production well. In the case of ROZs, the reservoir has essentially been waterflooded by nature and requires enhanced oil recovery technologies, such as CO₂ flooding, to produce the residual oil.

The UTPB study focused on understanding and modeling fluid flow within ROZs in the Artesia Fairway — a dolomitized trend in the San Andres formation containing oil-producing fields — of eastern New Mexico and west Texas. Utilizing geologic and production data, UTPB researchers determined that oil saturations within ROZs range from 20 percent to 40 percent, with an average of 32 percent, which is similar to that of mature, waterflooded reservoirs. The study also found that ROZs exist in all fields producing from the San Andres formation where it has been uplifted in the western part of the Permian Basin resulting in a tilted oil-water contact. The project's final report will be available in the coming weeks from the Research Partnership to Secure Energy for America (RPSEA) at <http://www.rpsea.org/project-reports/>.

NETL ORGANIZES COAL AND POWER TRAINING COURSE FOR U.S. DEPARTMENT OF STATE

For the 13th year in a row, the National Energy Technology Laboratory was tapped to organize the Coal and Power training course for the U.S. Department of State's Foreign Service Institute.

NETL is uniquely positioned for this honor in several ways. First, NETL has a long history of expertise in all things concerning fossil energy, being home to the Strategic Center for Coal, the Strategic Center for Natural Gas & Oil and also the Office of Strategic Energy Analysis & Planning. NETL has extensive connections within the power industry and with many universities involved with energy research. And as the only lab that is both government-owned and government-operated, NETL has often been called upon to manage funds for the U.S. Department of State, the U.S. Agency for International Development, the U.S. Department of Defense and others.

The course is offered each year to equip government officers to represent the nation in a wide range of government, commercial, economic and environmental issues by introducing them to technological and industrial developments in the U.S. power industry. The course covers, among other subjects, the rapidly emerging technologies in coal and power generation and discusses how these technologies are increasing in efficiency, reducing emissions, and driving down costs. Participants are encouraged to analyze the structure of the industry and worldwide power market regulatory reform.

Held this year on July 16–20, the five-day event began in Pentagon City, Va., where NETL's Venkat K. Venkataraman opened the session with an orientation and overview.

Assistant Secretary for Fossil Energy Charles McConnell then gave the opening address, followed by welcoming



Don Remson and Andrea Dunn, two NETL staff members who participated in the Foreign Service Officers training course, are looking at a lump of coal at the Cabin Run Mine operation at the Cabin Run Mine outside of Frostburg, Maryland.

remarks by Ambassador Carlos Pascual, Special Envoy and Coordinator for International Energy Affairs at the U.S. Department of State.

The 22 attendees came from the U.S. Departments of State, Commerce, and Energy. Through a combination of 21 informational classroom sessions, several discussion times, and six onsite tours, the group was initiated into fossil fuel fundamentals, such as history, mining, preparation, markets, trade, international activities and regulatory issues.

Examples of non-fossil power generation were represented by talks about hydro, nuclear and alternative power. Information about power transmission and distribution and a smart grid overview was also included.



The State Department Foreign Service Officers Power Training Class standing in front of a Range Resources Corporation Marcellus shale gas well pad in western Pennsylvania.

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“Training” continued from page 8...

Onsite tours for those attending the course included one of the newest coal-fired plants in the nation, AES Corporation’s world-class 180-megawatt Warrior Run Power Plant in Cumberland, Maryland. Also toured were Vindex Energy Corporation’s Cabin Run Mine in Frostburg, Md.; FirstEnergy Company’s three 914-megawatt coal-fired boilers at the Bruce Mansfield Power Plant in Shippingport, Pa.; Range Resources Corporation’s Marcellus shale well pad in Canonsburg, Pa.; FirstEnergy Company’s 44-megawatt gas-fired Springdale Power Plant in Springdale, Pa.; and NETL’s Office of Research and Development Plateau in Pittsburgh, Pennsylvania.



Course participants interacting with the tour guide at the Bruce Mansfield Power Plant conference room on July 18.



Photo courtesy of the Department of State

Course participants with Assistant Secretary for Fossil Energy Charles McConnell (right side, in red tie) and Ambassador Carlos Pascual, Special Envoy and Coordinator for International Energy Affairs, U.S. Department of State (in blue tie) at the Ritz-Carlton in Washington, D.C., on July 16, 2012.

NETL-RUA ENGINEER EARNS PRESIDENTIAL AWARD

A Carnegie Mellon University professor who worked with the National Energy Technology Laboratory on research that could help meet carbon capture goals has earned a Presidential Early Career Award for Scientists and Engineers (PECASE).

Dr. John Kitchin of Carnegie Mellon’s Department of Chemical Engineering was recognized by the White House for his research in electrochemical separations for energy applications, which has the potential to enable clean coal technologies that meet Department of Energy goals for carbon capture. He was also recognized for his dedication to educating the next generation of scientific leaders.

The annual PECASE awards are the highest honor bestowed by the U.S. government on outstanding scientists and engineers in the early stages of their independent research careers. Kitchin was nominated for the award by the Office of Fossil Energy for his research efforts in collaboration with NETL and its Research University Alliance (RUA), an alliance of five universities that conduct fully integrated basic and applied energy and environmental research.

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“PECASE” continued from page 9...

Kitchin has made significant contributions to the development of carbon capture technology in his collaborations with NETL, advancing efforts to enable the environmentally responsible use of fossil fuels in electricity generation. He was the first to demonstrate the use of an alkaline ion exchange membrane in the electrochemical separation of oxygen from air, which has the potential to displace cryogenic air distillation as the method for producing oxygen for oxy-combustion power generation. This advance also allows the use of inexpensive base-metal catalysts, and is closely linked to Kitchin’s contributions to fundamental advances in the computational modeling and design of new catalyst materials, for which he received a research grant under DOE’s 2010 Early Career Research Program.

Aside from his research and active support of the NETL-RUA carbon capture research team, Kitchin is an innovative teacher, having mentored 14 undergraduates and developed an interactive webinar series of lectures that were delivered live to grade school students. In appreciation of his dedication, he was awarded the Kun Li Teaching Award in 2010 for best lecturer in his department, as voted on by the senior class at Carnegie Mellon University.

FIRST-GENERATION RISK PROFILES HELP PREDICT CO₂ STORAGE SITE OBSTACLES

Comprehensive Methodology by DOE Lab Collaboration Will Help Ensure Safe, Permanent Carbon Storage

In support of large-scale carbon capture, utilization and storage (CCUS) projects, a collaboration of five Department of Energy national laboratories has completed first-generation risk profiles that, for the first time, offer a means to predict the probability of complications that could arise from specific carbon dioxide (CO₂) storage sites.

With their detailed methodology for quantifying risk potential at underground carbon storage sites, the profiles will help support safe, large-scale CCUS projects, an important option in the effort to reduce human-generated CO₂ emissions linked by many experts to global climate change.

The profiles are a product of the National Risk Assessment Partnership (NRAP), led by the National Energy Technology Laboratory and the NETL-Regional University Alliance (Carnegie Mellon University, Penn State, University of Pittsburgh, Virginia Tech, and West Virginia University). The five national labora-

tories that form the Partnership and the expertise contributed include:

- Lawrence Berkeley National Lab — monitoring for risk assessment;
- Los Alamos National Lab — modeling for risk assessment;
- Pacific Northwest National Lab — risks to groundwater systems;
- Lawrence Livermore National Lab — natural seal integrity; and
- NETL — wellbore integrity.

The effectiveness of carbon storage depends greatly on the ability of a specific site to store CO₂ permanently. However, variable field conditions, such as geology, wellbores, and fractures, can complicate researchers’ abilities to predict potential risks. Following injection for underground storage, the site is monitored to ensure the CO₂ remains permanently contained. However, a technical challenge for all storage sites is how to predict the long-

term effectiveness of the storage site and what potential risks might develop.

NRAP’s risk profiles offer a more concrete and detailed profile, meaning scientists will be able to design site-specific monitoring and mitigation strategies to minimize potential liabilities.

Additionally, NRAP’s first-generation risk profiles define the quantitative probability of when key indicators could cross specific thresholds over time. For example, current profiles can predict the probability that more than 0.01 percent of the quantity of CO₂ injected will be released back to the atmosphere for certain well configurations. Using these indicators, scientists will be able to assess potential consequences to human health, environmental health, and damage to property.

To read more about the risk profiles, visit http://www.fossil.energy.gov/news/techlines/2012/12043-Risk_Profiles_Aid_CO2_Storage.html. The risk profiles will be available online in the near future.

Upcoming Events

<http://www.fossil.energy.gov/news/events/index.html>

The Office of Fossil Energy and the National Energy Technology Laboratory exhibit at various events throughout the year. Stop by our booths to learn more.

October 15-18

[2012 International Pittsburgh Coal Conference](#)
Pittsburgh, PA

October 28-31

[2012 Gasification Technologies Conference](#)
Washington, D.C.

October 28-November 2

[American Institute of Chemical Engineers Annual Meeting](#)
Pittsburgh, PA

October 31-November 1

[19th International Petroleum Environmental Conference](#)
Denver, CO

November 28-29, 2012

[2nd Annual Energy & Innovation Conference](#)
Canonsburg, PA

December 11-13

[Power-Gen International](#)
Orlando, FL



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Comments are welcome and may be submitted to the editor.