



Photo: Derek Walters, EERC

Newly appointed U.S. Under Secretary of Energy C.H. "Bud" Albright at Air Quality VI.

## Record Crowd Attends Air Quality VI Conference

The sixth International Conference on Air Quality: Mercury, Trace Elements, SO<sub>3</sub>, Particulate Matter, and Greenhouse Gases attracted over 450 attendees from 14 countries, 41 states, the District of Columbia, and six Canadian provinces. The biennial conference was held September 24–27, 2007, at the Crystal Gateway Marriott Hotel in Arlington, Virginia. Over 70% of the attendees represented industry and utility companies with government, research, academia, and media making up the remainder of the mix.

First held in 1998, the Air Quality Conference has become the premier international conference on mercury, trace elements, SO<sub>3</sub>, particulate matter, and greenhouse gases in the environment. The 3½-day event provided comprehensive technical sessions on air quality impacts on policy, health and ecosystems, emission prevention and control, measurement methods and

atmospheric reactions and modeling, and greenhouse gas issues.

“The EERC’s lead role in the Air Quality conferences has brought tens of millions of dollars worth of research, development, demonstration, and commercialization to the EERC,” says Tom Erickson, Associate Director for Research at the EERC. “In addition to the resultant work in the areas of mercury, heavy metals, and SO<sub>3</sub> emissions from coal combustion systems, our current work with the Defense Advanced Research Projects Agency on fuels development (nearly \$5 million) and with others on emission control contracts for the military (soon to exceed \$1 million) started from conversations at Air Quality conferences.”

U.S. Under Secretary of Energy C.H. “Bud” Albright delivered the opening keynote address at the conference. Albright oversees the U.S. Department of Energy’s (DOE’s) energy and environmental programs.

Other keynote speakers included U.S. Senator Kent Conrad (D-ND); U.S. Senator Byron Dorgan (D-ND); U.S. Congressman Earl Pomeroy (D-ND); and Carl Bauer, Director of DOE’s National Energy Technology Laboratory (NETL). Humanities scholar Clay Jenkinson, in the persona of President Theodore Roosevelt, was an additional speaker at the conference. The opening panel, coordinated by Mike Holmes of the EERC, assembled some of the nation’s top energy experts to debate the challenges and opportunities facing today’s energy industry.

Anne Fiala, Technical Program Coordinator, was pleased to note that

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the conference's technical program featured over 100 specially selected presenters from Canada, China, the United Kingdom, Norway, Japan, Germany, and the United States. The Air Quality VI exhibit show featured a select group of leading organizations in the air quality sector. Over 30 poster presenters representing 11 countries participated in the poster session.

Deb Haley, Senior Event Manager, was delighted with the positive feedback received on evaluation forms. Some comments included the following.

"I chose this conference over the other meetings that were being held at the same time because of the better opportunities for networking and the wide variety of papers being presented," Jeff Gerken of American Electric Power said.

Thomas Houlihan of ECO-Energy Solutions Inc. remarked that the conference was a "very informative meeting—a good mix of policy and technology."

"It was an excellent conference, both technically and organizationally," added attendee Mike Rini of ALSTOM Power, "the best I've attended in 30 years!"

Event sponsors included the EERC, DOE NETL, the Center for Air Toxic Metals® through EPA's Office of Research and Development National Center for Environmental Research, and the Electric Power Research Institute, Inc.

Mark your calendars now for the Air Quality VII Conference, which will be held October 25–29, 2009, at the Crystal Gateway Marriott Hotel in Arlington, Virginia.

For more information on AQVI or to access details about the program and presenters, visit [www.undeerc.org/AQVI](http://www.undeerc.org/AQVI).

– Sandy Van Eck



Photos: Wes Peck, EERC

Eagle Operating crew on the drilling platform in Burke County, North Dakota.

## EERC's PCOR Partnership Tests CO<sub>2</sub> Sequestration Potential

Whether you refer to it as global warming or climate change, there is little doubt that the earth is warming up. Most of today's energy technologies release carbon dioxide (CO<sub>2</sub>) into the environment, and there is growing concern that CO<sub>2</sub> in the atmosphere might affect global climate and weather.

As the world seeks solutions to reduce CO<sub>2</sub> concentrations, one potential solution is being investigated by the EERC's Plains CO<sub>2</sub> Reduction (PCOR) Partnership. In August 2007, drilling began in an unminable lignite coal seam in Burke County, North Dakota, as one of four field validation tests currently in various stages of implementation by the PCOR Partnership.

The lignite field validation test was designed to gather the knowledge needed to predict performance of CO<sub>2</sub> sequestration (long-term, underground storage) in lignite seams and gather useful information on the dynamics of simultaneous CO<sub>2</sub> sequestration and coalbed methane (CBM) production.

"When CO<sub>2</sub> comes in contact with coal, including low-rank coal like lignite, the CO<sub>2</sub> molecules become physically adsorbed to the coal itself. This helps to ensure that the CO<sub>2</sub> will remain stored in the underground coal seam indefinitely," said PCOR Partnership Project Manager Ed Steadman. "As a result, the many deep, unminable coal seams throughout the world may offer significant opportunities for the long-term underground storage of CO<sub>2</sub>."

Natural gas found in coal seams, called CBM, is found in many unminable coal seams. Injecting CO<sub>2</sub> gas into the coal seam can displace the CBM, allowing more of the CBM to be recovered and used and providing an economic incentive to offset costs of CO<sub>2</sub> sequestration.

The 4-year lignite field validation test study will be conducted in two phases: Phase I will include data collection on the coal seam and an investigation of the CBM production potential. Phase II will include actually injecting CO<sub>2</sub> into the coal seam. The PCOR Partnership is collaborating with Eagle Operating,

Inc., an oil field operating company from Kenmare, North Dakota, on the project.

All five wells in Burke County have been drilled, and there are plans for additional testing on the wells based on the information gathered during the drilling activities.

“We are in the process of analyzing the data gathered from the geophysical logs and core collection,” stated Lisa Botnen, EERC Research Scientist. “We will use those results in a simulation model to give us a better picture of what’s going on underground so that we can anticipate where the CO<sub>2</sub> will travel once injected.”

The EERC’s PCOR Partnership is one of seven lead organizations in the United States designated by DOE NETL to investigate carbon capture and sequestration options. The PCOR Partnership is funded by DOE NETL and includes nearly 70 public and private partners in all or part of nine states and four Canadian provinces in the central interior of North America.

– Trish McGuire



Dave Fischer, Fischer Oil & Gas, observing core collection.



Photo: Kerryanne Leroux, EERC

An aerial view 10 miles from Port Graham, Alaska, illustrates both the beauty of the area and the challenges of providing energy to a remote village.

## The EERC Provides Renewable Energy Solutions for Remote Alaskan Village

The University of North Dakota (UND) EERC recently conducted a feasibility study to determine the most economical solutions to provide biomass energy to the Chugachmiut Tribal Community in the village of Port Graham, Alaska, located about 180 miles southwest of Anchorage on the southern tip of the Kenai Peninsula. The community comprises 140 members, mostly of Aluigi descent.

The village is only accessible by air or water, making traditional energy sources expensive to deliver and alternative forms of energy difficult to implement. The area has only local unpaved roads, and four-wheelers are used to get to the village of Nanwalek, just 4 miles away. The remote village gets electricity by power lines from Homer, over 30 miles away, and has Internet access and some satellite dishes but no cell phone service. Fuel and many foods, goods, and services must be imported into the community. The tribe has been investigating ways to use locally available biomass resources to reduce energy costs and dependence on these outside resources.

“The dramatic rise in prices for petroleum fuels has been a hardship to Port Graham,” said Kerryanne Leroux, EERC Research Engineer. However, the area has thousands of acres of timber. “Underutilized forest and timber from thinning or clearing activities or trees damaged by severe weather can be used for fuel to provide heat and power without harvesting healthy trees.” This low-value forest residue as well as timber depleted by spruce beetle activity would otherwise be left as waste material.

Because of the abundance of salmon and an established cannery and canning operations in Port Graham, fish oil generated from fish-processing wastes is another potential biomass fuel.

Port Graham has 70 residential buildings and several community buildings: a clinic, two stores, cannery, tribal council building, Native corporation building, and school. After the 8th grade, students must go to boarding school in Homer. Every

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building in the village currently burns diesel fuel.

The EERC feasibility study concluded that the most economical option (involving the least amount of capital outlay) for implementing biomass energy in the village of Port Graham would be burning a fish oil–diesel-blended fuel. The blend would be 50% oil–50% diesel, as a greater percentage of fish oil would “gum up” the burners. This option could use the village’s existing fuel oil burners but would require purchasing a fish waste-processing facility.

The second option would be to heat individual buildings in the village using indoor wood boilers, but those homes and buildings without boilers would have to be outfitted. This option requires logging and chopping logs. No processing facility would be necessary, but the purchase of new furnaces or boilers for all buildings would be required. Wood boilers are also less efficient and have pollution concerns. Therefore, this option is less attractive to the tribe.

The third option involves utilizing a gasification system for gas heat to be pumped to all buildings and electricity generation to replace the electricity currently imported to the village power station from Homer. This option would also utilize the wood waste from the surrounding forest but would require an extensive revamping of the village’s heating system, involving purchasing a chipper or grinder to reduce the wood waste for automation of feed, the gasifier itself, piping installation for syngas delivery, new furnaces or boilers for each building in the village, and microturbines that run off syngas to generate electricity. Although this option would involve an outlay of about \$1.6 million, the tribe could save over \$100,000 per year in energy costs.

This third option is the most desirable option for the tribe members as their ultimate goal is to become energy independent.



As the sun sets, EERC Lead Research Information Associate Jimmie Kennedy (right) and her husband, Aaron (left), use a county road map to plot their storm chase route.

## Jimmie Kennedy, Storm Chaser

Given that most of us in the Midwest spent the summer this year taking cover from the rain, flooding, and tornadoes, you might wonder why someone would actually go looking for bad weather.

For Jimmie Kennedy, Lead Research Information Associate for the EERC, bad weather brings some excitement and a chance to spend some valuable time with her husband, Aaron, who is pursuing his doctorate in atmospheric sciences at UND. A former meteorology student herself, Kennedy says one of her favorite hobbies is “storm chasing,” the name given to pursuing severe weather such as lightning and tornadoes in order to witness or photograph their effects.

The Kennedys met while both were in the University of Oklahoma (OU) meteorology program as undergrads. They often chased storms as a hobby and as part of Aaron’s research for his master’s degree, which focused on severe storm analysis.

“We went on our first chase together in the fall of 2001 in the northwest Texas area and even missed an OU football game to do so,” says Jimmie. “Sooner football is second only to tornadoes at our house!”

Aaron has been a trained storm spotter since high school, and he and Jimmie routinely turn information gathered over to the National Weather Service.



Photo of a tornado in South Dakota taken by Aaron Kennedy

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The couple decides if a storm is worth chasing by watching a U.S. government Internet site in Norman, Oklahoma, called the Storm Prediction Center (SPC), which has its own meteorologists and puts out severe weather outlooks as far in advance as 4–8 days. Aaron also makes his own forecasts using freely available meteorology data and models, and the couple compares that forecast to SPC's while in the field to make sure the two agree.

While storm chasing was a common hobby and area of research for many students at OU, it is not as popular up here at UND. The Kennedys organized an unofficial graduate student group of about eight, which typically goes out in a couple of cars, communicating with each other by cell phone. Usually Aaron and Jimmie lead the group, with Jimmie navigating via the computer.

“With the advent of mobile broadband Internet, we've got all the tools we need at the touch of a button on my laptop computer that's connected to our cell phone by a cable. We have access to radar data from any site in the United States, as well as model runs, visible satellite, National Weather Service balloon launch data, and more,” says Jimmie. “I monitor the development and progress of storms, and we decide on our route from there.”

Other tools include a weather radio, a ham radio (Aaron has his license), a digital camera, and local atlases that

show county roads. This is quite a change from their early days of chasing with no laptop, weather radio, or cell phone. Despite all the technology, though, storm chasing is still not an exact science.

“Sometimes, though, we can have all the data in the world, but we've learned it's better to go with Aaron's scientific instinct and just look at the sky with our own eyes to guide us,” says Jimmie. “Aaron and the other meteorologists know the science behind the storms, the structure, location, direction, and so on, and they never put themselves in harm's way.”

Before the devastating tornado hit the small town of Northwood, North Dakota, on August 26, 2007, Aaron and the UND group chased the storm and took pictures, but this time Jimmie was navigating from the computer at home and communicating with the group via cell phone. The couple had just cancelled their wireless broadband service 2 days before, assuming the storm season was nearing its end. Although the group was within 6 miles of the tornado, they didn't realize its impact at the time because of the poor lighting conditions and rain.

“Storms are exciting and awe inspiring,” says Jimmie, “but you are always torn looking at them because you are always aware that people could be losing their houses . . . or even worse.”

– Sandy Van Eck

*To see more pictures of Jimmie and Aaron's adventures chasing storms, go to [www.convectionconnection.com](http://www.convectionconnection.com). One of Aaron's photographs of a lightning storm is being published in the 2008 Weather Calendar.*

## Storm Chasers

Storm chasers generally fall into one of three categories. Storm chasing is sometimes a recreational pursuit with no degree or certification required, and it can be much more dangerous if chasers do not have the proper knowledge or training. Other storm chasers are paid either to take customers (tourists) on storm chase vacations or by television or media crews to chase storms to get pictures or video. Finally, many storm chasers have meteorology degrees and chase storms not only because severe storms are their passion but for academic- or government-related weather research or to apply their meteorological education.

Often, storm chasers are also trained storm spotters, reporting their observations to local authorities or the National Weather Service for the verification or issuance of severe weather or tornado warnings.



*Kennedy in the summer of 2006. The funnel cloud can be seen coming down out of the left side of the storm cloud.*

# New Employees



**Cynthia Carter** is a Research Information Associate at the EERC, where she provides administrative support in the successful production and

completion of research projects, including preparing proposals, reports, technical papers, presentation materials, and other documents.

Ms. Carter has been a word processor since 1994. Prior to her position at the EERC, she served as a Senior Word Processing Specialist with CBF Group/Integreon in Fargo for 2½ years. She holds a B.S. in Business Administration from San Diego Christian College, El Cajon, California.

Ms. Carter is interested in alternative fuels, energies, and means of transportation and appreciates that many of the EERC's projects and efforts involve cutting-edge technologies and processes in these areas.

She also likes the people here. "Everyone I've met and worked with is so helpful and friendly. That's a good characteristic to have in an organization," she says.

A native of California, Ms. Carter grew up in San Jose, in the heart of the Silicon Valley, where her father worked for IBM as an electronics technician for 25 years.

When she's not working, Ms. Carter likes to read historical fiction and ancient texts and watch sci-fi fantasy, anime (a style of animation originating in Japan), and historical fiction movies. She also does beading (necklaces, bracelets, and décor) and gardening and enjoys playing with her seven cats.

Ms. Carter and her fiancé like to explore the Twin Cities, go for walks, visit coffeehouses, watch movies and, when able to do so, take trips to the West Coast to visit friends and family.



**Trent Dregseth** is a Research Instrumentation

Technician at the EERC, where his work involves the installation, maintenance, repair, and operation of

instruments and equipment used in the EERC's bench-, pilot-, and field-scale testing.

Two of the positive aspects of working at the EERC for Dregseth are the people he works with and the interesting variety of projects to which he's assigned.

"I am always learning new things, and I am not doing the same thing day in and day out," says Dregseth.

"The people here are friendly and easy to work with," he adds.

Prior to his position at the EERC, Fargo native Dregseth served as a Network Intern for the Fargo Public School District and as a Service Specialist for Scheel's Home and Hardware.

Dregseth holds an A.A.S. in Computer Electronics Technology and a first-year Electronics Core Certificate from Minnesota State Community and Technical College in Moorhead.

When he's not working, Dregseth enjoys camping, fishing, hunting, biking, watching sports, and building computers.



**David Dunham** is a Research Engineer at the EERC, where he works with advanced energy systems, pollution control, and emission measurement. Dunham's

professional areas of interest include renewable energy sources and environmental controls as well as new product and business development.

"I enjoy the variability of the work as well as the option to someday pursue and run my own projects and research ideas," Dunham says of the EERC. "I have been involved with the construction of the thick-bed mercury absorption system for the mercury control study and the actual experiment from Day 1," Dunham says.

Home-schooled until he was a junior in high school, Dunham holds a bachelor's degree in Mechanical Engineering and a B.S. degree in Chemistry from UND.

A Grand Forks native, Dunham started his own lawn care company when he was fourteen and, over the years, grew the business considerably. He paid for his entire college education with the money he made from that business and from working as a carpenter for a couple of summers while he went to school in Ohio. He still owns and manages the business.

Dunham's hobbies include water skiing, golf, hockey, snowboarding, and basketball. He also plays classic and alternative rock music on guitar, primarily for his own enjoyment but also at church. In the summer, he often joins his six younger siblings and parents at the family's cabin on Bad Medicine Lake in Minnesota.



**Bill Gerszewski** is a Technology Development Operator at the EERC, where his work involves construction, operation, and maintenance of bench- and pilot-

scale test equipment. He's currently working on the setup of the hydrogen reactor at the National Center for Hydrogen Technology (NCHT) demonstration building.

"There's lots of new technology involved in all the building going on here at the NCHT, and it's interesting to be in on the beginning of its use," Gerszewski says.

Before coming to work at the EERC, Gerszewski worked for 3 years as an operations manager with Motion Industries in Grand Forks. Before that he was with the UND Steam Plant for 8 years where he held several positions, from operator to mechanic to shift supervisor. Gerszewski says he prefers physical work over "a desk job" any day.

In the summer, Gerszewski and his wife and 9-yr-old son go bass fishing in Minnesota lakes around the White Earth area. Although he denies trying to hit every lake in Minnesota, he admits they usually try to go to a lake they've never visited. "With 10,000 of them, why go back to the same one all the time?" he says.

Gerszewski also likes to read about the history of civilization, specifically the Dark and early Middle Ages around the time of the rise and fall of the Egyptian and Roman Empires.



EERC Research Scientist **Nick Lentz** is finding that his professional interests in chemical analysis and mass spectrometry are being addressed in his work on many different projects

here at the EERC, including the mercury-selenium dietary interaction projects and mercury testing.

"I like the idea of generating ideas and solutions to the global issues that are the focus of the EERC," says Lentz. "The people are friendly, and I enjoy working on many different projects."

Prior to his position at the EERC, Lentz served as a Research Assistant at Iowa State University. As a graduate student, his research focused on applications of electrospray ionization mass spectrometry and inductively coupled plasma mass spectrometry. He looks forward to using the knowledge gained in his graduate studies with projects at the EERC. While Lentz was in school, he worked on a farm and as a carpenter.

Lentz holds a B.S. in Chemistry from Bemidji State University and will be awarded a Ph.D. in Analytical Chemistry from Iowa State University in December 2007.

When he's not working, Lentz enjoys fishing, hunting, disc golf, and racquetball. Lentz's wife is a special education teacher at a regional Minnesota school. The two enjoy going on walks and bike rides as well as traveling.



**Tony Snyder** is a Research Engineer at the EERC, where he works in the areas of coal gasification for hydrogen and syngas generation, hydrogen purification and storage, and

renewable and conventional energy systems. He holds a B.S. in Chemical Engineering from UND.

"I came to the EERC because I wanted to get back into an engineering role that was more geared toward research and development. I'm also very interested in seeing renewable energy sources become more prominent in the U.S. energy portfolio, so the EERC seemed like a great fit for me professionally," says Snyder.

Prior to his position at the EERC, Snyder served as a Composites Quality Engineer at Cirrus Design. While there, Snyder implemented Six Sigma, a statistically driven defect reduction program.

"It helped save the company hundreds of thousands of dollars," Snyder says. "Through Six Sigma, I learned several new tools and skills for project management, data analysis, and experimentation that I think will be invaluable in my position at the EERC."

Away from the job, Snyder enjoys golfing, running, and weight training. Occasionally, he brews his own beer.

Snyder's wife is a senior lecturer in the UND Math Department, and they have two young children. Family time involves a lot of time outdoors, going to parks, walking, and riding bike.

– Sandy Van Eck



During a tour of the EERC are, left to right, Carl Bauer, Director, DOE NETL; Douglas Ray, Associate Laboratory Director of the Fundamental Science Directorate, Pacific Northwest National Laboratory; Gerald Groenewold, EERC Director; Norman Peterson, Government Affairs, Argonne National Laboratory; Senator Dorgan; Robert Rosner, Director, Argonne National Laboratory; Thom Mason, Director, Oak Ridge National Laboratory; and Michael Kluse, Director, Pacific Northwest National Laboratory.

- On August 14, U.S. Senator Byron Dorgan (D-ND) hosted a meeting with several DOE national laboratory directors that included a press conference at the EERC, a meeting with EERC personnel, and a tour of the EERC.

Senator Dorgan's vision of the Red River Valley Research Corridor and his dedication to developing and enhancing science- and technology-based enterprises throughout North Dakota led to the August 14 meeting, which focused on partnering the state's university researchers and technology companies with national laboratories.

- This October 18–19, 2007, the Plains CO<sub>2</sub> Reduction (PCOR) Partnership will hold its 2007 Annual Meeting at the EERC. This members-only meeting will feature a progress report and overviews of carbon market trading, proposed regulatory frameworks, and Phase III plans. For more information on the meeting, please check the Web site at [www.undeerc.org/PCOR/annualmtg](http://www.undeerc.org/PCOR/annualmtg).
- Previously this summer, the EERC and the PCOR Partnership were hosts to the DOE NETL Laboratory Carbon Sequestration Regional Partnerships program's 3rd Annual Carbon Capture, Separation, and Transportation Working Group Workshop. Prior to the workshop, interested participants visited the Dakota Gasification Company's Great Plains Synfuels Plant in Beulah, North Dakota, where they were able to see the process whereby lignite is gasified to produce syngas, CO<sub>2</sub> is separated from the gas stream using the Rectisol® process, and the CO<sub>2</sub> stream is compressed to 2700 psig and sent via pipeline to Canada for sequestration during enhanced oil recovery activities at the Weyburn oil field in Saskatchewan.

Port Graham continued

Because of the harsh Alaskan winters, all options would require leaving current diesel or wood burners in place as backup systems. Even the power station has a diesel-powered generator for power when the electricity from Homer goes out.

The Chugachmiut Tribal Community was created to assist the seven Native communities of the Chugach Region of Alaska with self-determination. The EERC study will be used by tribal leaders to formulate an overall energy plan. This project was sponsored by the U.S. Department of Energy Tribal Energy Program.

The next step, as yet unfunded, is an on-site demonstration of the gasification system. The EERC's suggested plan could be implemented within the next several years.

"Of all of the alternative energy and renewable resource options we talk about and plan for at the EERC, this would be the perfect application," says Leroux. "The area is of special interest because it is so remote."

– Sandy Van Eck

## EERC EDGE

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Energy & Environmental Research Center  
15 North 23rd Street, Stop 9018  
Grand Forks, ND 58202-9018  
(701) 777-5000  
[www.undeerc.org](http://www.undeerc.org)

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