

# EERC News Highlights

*University of North Dakota* Energy & Environmental Research Center **2003**



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## January

### Innovative Mercury Control Technologies Developed



Researchers at the University of North Dakota (UND) Energy & Environmental Research Center (EERC) are leading an effort to help coal-fired electric utilities on both sides of the U.S.-Canadian border. The EERC is completing work on Phase I of a two-phase project focused on developing and testing mercury control technologies. "The results generated in Phase I are being used in the next phase of the project to guide the design, construction, and application of the most promising sorbent-based technology identified," said Senior Research Advisor John Pavlish. In Saskatchewan and lignite-producing states like North Dakota, the challenge is more difficult

because the mercury is emitted in a difficult-to-control form. Both countries need to significantly reduce their mercury emissions in the near future as a result of impending regulatory controls.

## February

### EERC Leads the World in Energy and Environmental Technologies

The EERC continues to evolve and expand, adapting to changing conditions in the environment and addressing major societal needs, strengthening global energy security, and striving toward a zero-emission power plant. The EERC's nine Centers of Excellence are making this success possible by leading the world in providing expertise in scientifically advanced energy systems and the prevention and cleanup of air, water, and soil pollution. The Centers of Excellence include the Center for Air Toxic Metals<sup>®</sup> (CATM<sup>®</sup>), the Center for Biomass Utilization<sup>®</sup>, the Coal Ash Research Center<sup>®</sup>, the Coal Utilization Technologies Center, the National Alternative Fuels Laboratory<sup>®</sup> (NAFL<sup>®</sup>), the Supercritical and Subcritical Extraction Technologies Center, the Water Management Center, the

Wind Energy Resources Center, and the Emission Control Technologies Center. The Centers of Excellence have received national recognition and international acclaim in their specific topic areas and were formed to provide strategic solutions to energy and environmental issues.



## EERC Senior Research Advisor Honored for Outstanding Research

Dr. Joseph Hartman, EERC Paleontologist/Geologist and Senior Research Advisor and Associate Professor in the Department of Geology and Geological Engineering at UND, was presented the Sigma Xi Faculty Award for Outstanding Scientific Research during UND's Founder's Day Banquet, February 27. Hartman's principal areas of interest are the historical geology of Upper Cretaceous and Paleogene strata of the northern Great Plains, with an emphasis on the evolution and extinction of nonmarine mollusks in the Western Interior of North America. Topics of current focus include Cretaceous-Tertiary (K/T) boundary interval studies in Montana, North Dakota, and India and the chronology of sea-level changes during the Paleocene. He has authored and coauthored publications on these and other subjects on climate change, science education, and the history of western explora-



*EERC Senior Research Advisor Dr. Joseph Hartman received the Sigma Xi Faculty Award for Outstanding Scientific Research.*

tion. Hartman's research objectives include using molluscan biostratigraphy and paleobiogeography and associated lignite stratigraphy, land-mammal biochronology, and other environmental and temporal data to assist in understanding faunal change in ephemeral environments through time, both as a consequence of climate change and basic Earth processes. To this end, Hartman has conducted field and museum research throughout the Western Interior of North America and in China, Madagascar, India, and western Europe. Hartman joined the EERC and UND in 1986.

## March

### Wind IV Conference Draws Large Attendance



*Wind IV Opening Session*

More than 375 people from across the United States and Canada attended the Wind Energy and Rural Development in North Dakota IV Conference at the Bismarck Civic Center. For the second year in a row, the wind conference incorporated the Wind Energy Expo, which featured more than 40 manufacturers and organizations from across the country showcasing their products and services. At the conference, top industry leaders spoke on critical issues facing the wind industry in the state and nation. The conference allowed participants to see firsthand the exciting advancements in wind energy technologies and network with key industry leaders. The Wind Conference was sponsored by U.S. Senator Byron Dorgan (D-ND) in conjunction with the EERC and the North Dakota Department of Commerce Division of Community Services.



*Representative Earl Pomeroy (D-ND)*

## April

### Online Coal Ash Buyer's Guide Developed

Researchers with the Coal Ash Resources Research Consortium<sup>®</sup> (CARRC<sup>SM</sup>) developed the online "Buyer's Guide to Coal Ash-Containing Products" to showcase the many uses of coal ash in products ranging from building materials to bowling balls. One hundred million tons of coal combustion by-products are produced in the United States each year by burning coal to generate electricity, and these by-products are a valuable resource that can be used as raw materials for a wide variety of industries. CARRC was founded in 1985 as an international consortium of industry and government representatives, scientists, and engineers working together to advance coal ash utilization worldwide.



# Summer of 2003

## EERC Senior Research Manager Testifies Before U.S. Senate Committee

Dr. Steve Benson, Senior Research Manager, testified June 5 before the Subcommittee on Clean Air, Climate Change, and Nuclear Safety of the U.S. Senate Committee on Environment and Public Works. Dr. Benson provided a realistic perspective on the technical challenges facing mercury control for western coal-fired power plants, one of the most critical issues facing the utility industry today. "Aggressive mercury emission standards could put western utilities and their customers at a serious and unnecessary economic disadvantage," Benson said.



*Dr. Steve Benson*

The U.S. Senate committee is considering regulatory options to control mercury emissions as part of the Clear Skies Act initiated by President Bush. Mercury is an immediate concern for the U.S. electric power industry because of the U.S. Environmental Protection Agency's (EPA's) decision to regulate mercury emissions from coal-fired electric utility steam-generating units.

## Symposium Packs a Worldwide Punch

Mercury control, one of the most critical issues facing the utility industry today, attracted worldwide attention at the 18th International Low-Rank Fuels Symposium June 24-26, 2003, in Billings, Montana. The event attracted registrants from 22 states and 13 countries around the world. The goal of the symposium was to provide a forum in which the coal industry, government, and research organizations could share up-to-date information on the role of low-rank fuels in meeting future energy needs.

Keynote speakers for the symposium included Senator Conrad Burns (R-MT), Senator Byron Dorgan (D-ND), and Rita Bajura, Director of the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL). The 3-day symposium was organized and sponsored by the EERC, DOE, and EPRI.

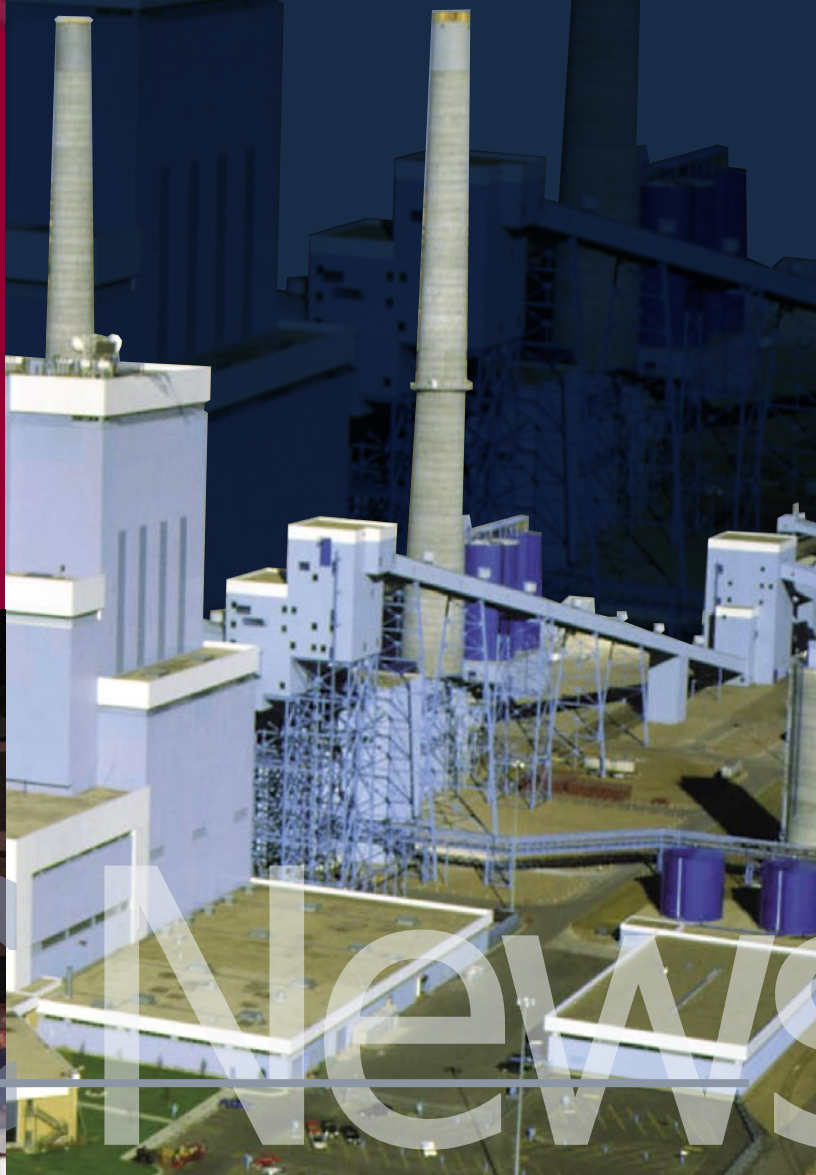


*U.S. Senator  
Conrad Burns  
(R-MT)*

## \$1.4 Million Water Minimization Contract Awarded

The EERC was awarded a \$930,000 contract with DOE NETL to test and evaluate a new process to remove water from the exhaust gas of fossil fuel-fired power plants. Siemens Westinghouse Power Corporation also contributed \$478,000 in cost share to the project, bringing the project total to \$1.4 million. The project will help save endangered water resources, improve power plant efficiency, and reduce harmful emissions released into the atmosphere. Water consumption is one of the major technical challenges facing the utility industry today said EERC Director Gerald Groenewold. "This project is one of the cornerstones of the EERC's goal of a zero-emission power plant. It will allow the EERC to address this critical issue in partnership with a major private sector corporation and the federal government and could mean great things for future development opportunities throughout the region and the world."

The new process will recover a large fraction of the water present in power plant flue gas and perform engineering evaluations to determine how such technology can be integrated into various existing power systems. Depending on a plant's configuration and location, recovered water could be reused within the power plant or exported to external customers.



## \$7.9 Million in Mercury Contracts Awarded

The EERC received two contracts worth more than \$7.9 million to lead a consortium-based effort to resolve the mercury control issues facing the lignite industry. Over \$1.6 million in federal funding went to support the large-scale demonstration of mercury control technologies for lignite-fired units. The project will cost-effectively oxidize elemental mercury in lignite combustion gases to allow capture in a wet scrubber. The second project (\$6.3 million) focuses on demonstrating the feasibility of mercury control technologies for plants that burn lignite. The EERC uses multiple techniques to improve mercury removal in order to achieve a high level of cost-effective control.

## EERC Develops Emission Reduction Partnership



The EERC has developed a collaborative regional framework to support a comprehensive effort by DOE to control carbon dioxide emissions. The

Plains CO<sub>2</sub> Reduction (PCOR) Partnership will help explore new methods for carbon sequestration in the northern Great Plains of North America. PCOR includes private-entity partners from five states (North Dakota, South Dakota, Minnesota, Montana, and Wyoming) and two Canadian provinces (Saskatchewan and Manitoba). The EERC has received \$2.27 million in federal funding from DOE NETL to support the program, as well as \$1.33 million from more than 30 energy and environmental companies and organizations around the region (which brings the project total to \$3.6 million).

One of the main partners is Dakota Gasification Company, which is providing about \$700,000 in in-kind contributions. Five other entities—Basin Electric Power Cooperative, Montana-Dakota Utilities Co., Otter Tail Power Company, the North Dakota Industrial Commission (NDIC), and Great River Energy—are contributing a total of \$360,000 in cash.

The PCOR region includes the Williston and Powder River Basins and has 29 coal-fired utilities, 27 ethanol production facilities, and the Dakota Gasification facility that, together, account for about half of the region's CO<sub>2</sub> sources.

Other participating partners include Nexant-Bechtel, North Dakota State University, Prairie Public Television, Fischer Oil and Gas, the Western Governors' Association, Amerada Hess Corporation, Environment Canada, the Interstate Oil and Gas Compact Commission, the Petroleum Technology Transfer Council, NDIC's Oil and Gas Division, the North Dakota Geological Survey, the Minnesota Pollution Control Agency, the North Dakota Department of Health, the Montana Department of Environmental Quality, the Chicago Exchange, Eagle Operating Inc., the National Resources Trust, the North Dakota Petroleum Council, and Tesoro Refinery.

# September

## Air Quality IV Attracts Hundreds

More than 350 people from more than 187 organizations, 40 states, and 10 countries attended Air Quality IV: Mercury, Trace Elements, and Particulate Matter on September 22–24, 2003, in Arlington, Virginia. Air Quality IV provided a forum for industry, government, and research organizations to help enhance the environmental performance of the nation's future energy infrastructure and meet the challenges of upcoming regulations for mercury emissions from coal- and oil-fired power plants. The two streams of technical presentations featured more than 70 presenters from around the world discussing air quality impacts on health and ecosystems. The conference also



*Chairs and Presenters at Air Quality IV*

included more than 20 poster presenters and about 16 exhibitors from utilities and vendors nationwide.

The conference also featured opening keynote addresses by Senator Byron Dorgan and Jeffrey Holmstead, Assistant Administrator for Air & Radiation with EPA; a panel of five internationally renowned business, environmental, science, and government experts who debated the environmental policy surrounding airborne pollutants; a luncheon keynote address by Rita Bajura, Director of DOE NETL; evening banquet speeches by Senator Kent Conrad and Representative Earl Pomeroy; and a special appearance by Clay S. Jenkinson, who provided, in character, Thomas Jefferson's views on air quality and the environment.

Air Quality IV was sponsored by the EERC, DOE NETL, CATM through the EPA Office of Research and Development National Center for Environmental Research, and EPRI.



*U.S. Senator  
Kent Conrad (D-ND)*

# October

## Waffle<sup>SM</sup> Project Gains Worldwide Attention

The EERC's Waffle Project gained global attention and was featured during the International Conference of Geographic Information Systems (GIS) and Remote Sensing in Hydrology, Water Resources, and Environment in Yichang, China, in September 2003. EERC Senior Research Manager Bethany Bolles delivered a keynote speech entitled "An Innovative Basinwide Approach to Flood Mitigation: The Waffle Project." The Waffle Project is evaluating the water storage potential of preexisting "depressions" within the Red River Basin, such as low-relief fields bounded by raised roads. These storage areas, supplemented by roads and drainage structures, could act as a network of channels and control structures to slowly release stored water into the Red River and its tributaries as the flood crest passes.



*EERC Senior Research Manager Bethany Bolles stands in front of Three Gorges Dam near Yichang, China.*

## EERC Researchers Receive Distinguished Service Award

Three EERC researchers, Senior Research Manager Dr. Steve Benson, Senior Research Advisor Michael Holmes, and Senior Research Advisor John Pavlish, were awarded the Lignite Energy Council's 2003 Distinguished Service Award on October 23, 2003, in Bismarck, North Dakota, for their work with the Mercury Task Force Team and bench-scale and pilot-scale development efforts that resulted in DOE contract awards to conduct large-scale field tests at four North Dakota power plants. The Mercury Task Force Team was formed in early 2002 to maximize the time and financial investments made by North Dakota energy producers in developing new technologies to reduce mercury emissions and ensure compliance with future mercury control regulations.



*Steve Benson*



*Michael Holmes*



*John Pavlish*

# November

## EERC Director Named Research Advocate of the Year

The North Dakota Small Business Administration has chosen EERC Director Gerald Groenewold as the U.S. Small Business Administration (SBA) Research Advocate of the Year for his ability to use his professional skills and talents to further public understanding and awareness of small business research. The President of the United States designates 1 week each year to recognize the small business community's contributions to the American economy. The SBA Awards are given annually to outstanding small business persons and small business advocates. National winners are chosen from state and regional winners. Winners are selected based on length of time in business, growth in the number of employees, increases in sales and/or unit volume, improvement in financial condition, responses to adversity, and the business owner's contributions to community-oriented projects. Groenewold was one of four people nominated in the Grand Forks region by the Grand Forks Chamber of Commerce.



*EERC Director Gerald Groenewold*

## EERC Expansion Opens and EERC Celebrates Renewable Energy Week

The public got its first look at the new 47,000-square-foot building addition during an open house on November 13 and 14, 2003. Ground was broken July 30, 2002, for the expansion and renovation project. The new facility includes a 3-story building for 90 additional staff and meeting rooms to accommodate more than 300 people. The building project incorporates geothermal ground-source heat pumps, which are used for heating and cooling; fly ash concrete, made from a by-product of coal combustion; synthetic gypsum wallboard for the interior sheetrock made from the waste material produced in cleaning emissions from smokestacks; and higher-efficiency light fixtures.

Renewable energy such as alternative fuels, biomass, wind, and hydrogen fuel cells was the focus of a weeklong event at the EERC November 10–14, 2003. The week was designed to help others understand the exceptional technologies, programs, and partnerships available in renewable energy at the EERC and how they provide opportunities to enhance our region's economy and guarantee our nation's energy security. The events included a meeting of the Governors' Ethanol Coalition (GEC), the Biomass II Heat & Power Workshop, and an open house to feature the EERC's new \$6 million addition. The 29-member GEC, chaired by North Dakota Governor John Hoeven, met to develop long-term objectives pertaining to proposed legislation for renewable fuel standards. The Biomass II Heat & Power Workshop focused on emerging technologies in biomass for heat and power. During the all-day workshop, participants learned about the different types of biomass and how they provide fuel resource opportunities, discussed new technology, and developed opportunities for biomass utilization in their businesses or communities. Members of the Department of Energy Science and Technology, the Minister of Agriculture, and the Minister of Energy for the Province of Manitoba and 60 guests also toured the EERC.



*EERC Director Gerald Groenewold (second from left) leads a tour of the new EERC facility for Rick Killion, Prairie Business Editor; North Dakota Governor John Hoeven; Deb Haley, EERC Associate Director; and UND President Kupchella.*



*Southeast View of the New EERC Addition*

# December

## U.S. Senator and Senior DOE Officials Visit EERC

Dr. Gerald Groenewold coordinated a strategic planning meeting at the EERC with key partners including U.S. Senator Byron Dorgan (D-ND); Carl Michael Smith, Assistant Secretary for Fossil Energy, DOE; Rita Bajura, Director, DOE NETL; Lowell Miller, Director of Coal Fuels and Industrial Systems, Office of Fossil Energy, DOE; and Peter Kiefhaber, Senate Committee on Appropriations-Interior. This meeting provided an overview of five expanded initiatives such as advanced mercury technologies for the North Dakota lignite industry, an expedited carbon sequestration program, establishment of the National Hydrogen Technology Center at the EERC, establishment of the National Center for Energy and Water Sustainability at the EERC, and an enhanced coalbed methane program for the northern Great Plains. Each program reflects the unique strengths and capabilities of the EERC and can be utilized to enhance strategic DOE programs. All of these programs offer significant opportunities to expand nonfederal cost sharing.

In addition to the meeting, a press conference led by Senator Dorgan discussed the impacts of Energy and Appropriations Bills for the EERC and North Dakota and the relationship to the Red River Valley Research Corridor; Senator Dorgan's position on interior appropriations; and the potential for future research.



U.S. Senator Byron Dorgan (D-ND)



Left to Right: Hal Gershman, President, Grand Forks City Council/EERC Foundation Board; Robert Gallager, UND Vice President of Finance/EERC Foundation Board; John MacFarlane, Chairman of the Board, Otter Tail Corporation/EERC Foundation Board; Deb Haley, EERC Associate Director Marketing, Outreach, and Administrative Resources; Gerald Groenewold, EERC Director; Rita Bajura, Director, DOE NETL; Marv Kaiser, President, Kaiser Business Consulting/Attorney, EERC Foundation Board; Carl Michael Smith, Assistant Secretary for Fossil Energy, DOE; Lowell Miller, Director of Coal Fuels and Industrial Systems, Office of Fossil Energy, DOE; The Honorable Byron L. Dorgan, U.S. Senator (D-North Dakota); Sara Garland, President, Greystone Group/President, EERC Foundation Board; Everett Sondreal, EERC Principal Research Advisor; Michael Swenson, President and CEO Xcel Energy-Wisconsin/EERC Foundation Board; John Harju, EERC Associate Director for Research; Peter Kiefhaber, Senate Committee on Appropriations-Interior; Mike Jones, EERC Associate Director Industrial Relations and Technology Commercialization; and Tom Erickson, EERC Associate Director for Research.



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### For More Information

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