

KU Energy Research Center

www.kgs.ku.edu/ERC/index.html

Broadening energy-related projects and collaborations at The University of Kansas

- *Stimulate new research and development of energy technologies*
- *Contribute to the growth of the research enterprise and development of interdisciplinary research teams*
- *Provide Energy Development Grants to incubate new energy R&D program*

Perspective on Energy

A dependable, economical, and environmentally sound global energy supply is fundamental to a viable society. Research and development in energy supply and consumption are essential to meet growing demands of an increasing population and standard of living. Kansas continues to provide a stable domestic source of oil and natural gas with a promising future as new recovery options are exercised. The growth of Kansas' energy portfolio and output can be addressed through essentially untapped opportunities in alternative energy. Expansion of energy research into emerging areas such as biofuels and unconventional gas recovery represent opportunities to develop major new programs that benefit both Kansas and the nation.

**KU ERC Seed Fund Awards --
35 new innovative projects have received
\$220,000 since 1996, which has led to over
\$3 million in external contracts in fossil
and alternative energy**

2006 KU ERC Energy Research Development Grants Announced

ERC Campus Advisory Board announced winners of the 10th annual Energy Research Development Grants for 2006. A total of five new awards were made that total \$39,472. Projects support energy-related projects for new faculty and funds to support new research directions of new staff and faculty in Chemical and Petroleum Engineering, Civil, Environmental, and Architectural Engineering, Geology, and the Kansas Geological Survey.

**Dr. Wai Kiong (Oswald) Chong, CEAE, \$8,800,
"Improving life cycle performance and
energy consumption prediction using aged
samples and electron microscopy to
examine thermal and moisture
performance due to natural deterioration
of roofing materials".**

The merit of this proposal recognized by the board is improved measurements to assess roofing deterioration and the modeling thereof that may lead to new working relationships and possible external support from EPA and NIST. The linkage of this research with the successful phase-change building insulation project is also a strong feature of this proposal.

**Dr. Scott White, Kansas Geological Survey,
\$6,140, "The Kansas Energy Atlas".**

Project will provide geographic context to the energy data and projects in Kansas through the use of GIS technology with the intent to grow this activity to a national scale through external funding. The atlas should

Development Grants (continued)

substantially increase the ease of access to energy data and projects in Kansas, providing a new means to enable energy research in and outside of the KU community.

**Dr. Trung Van Nguyen, \$7,362, "Direct
Conversion of Coal to Electricity Using...
Fuel Cell Technology".**

Project is new and innovative with considerable upside potential to increase efficiency and make more environmentally benign the use of coal in electrical generation. Coal currently supplies 23% of the US electricity consumption.

**Mario A. Medina, CEAE, and Ray Taghavi,
Aerospace Engineering, \$8,670, "Reducing
the Fuel Consumption of Refrigerated
Vehicles Via a Phase Change Technology
Developed at KU".**

New collaborative effort to extend the use of phase change building insulation to transportation sector in order to demonstrate proof-of-concept for external funding. Prior research on use of phase change material in fixed walls has resulted in a 60% decrease in heat transfer across the walls, amounting to a considerable energy savings. This research would address design challenges and simulation software previously developed by Medina and Taghavi to model heat transfer and aerodynamics will be integrated. Preliminary data should help secure private and government funding.

**Jennifer A. Roberts, Luis Gonzalez, and Robert
Goldstein, Department of Geology, \$8,500,
towards equipment purchase to support
research program in carbonate diagenesis.**

New research will include industry-sponsored work on experimental carbonate precipitation and dissolution examining novel approaches to understanding quantifying carbonate diagenesis in natural systems.

Energy Portfolio

As of August 2006, 25 externally funded energy-related grants and contracts are run through the KU ERC, 11 in fossil energy and 14 in alternative energy.

Alternative Energy & Energy Conservation

- Fuel cell research
<http://tri.engr.ku.edu/research/foci.html>
- Electric motors and batteries
- Energy efficient building design -
<http://www.saud.ku.edu/mariom/Research-funded.htm>
- Biomass utilization – catalysts for gasification and hydrogenation
- Wind Power in Kansas (Kansas Energy Information Network)
<http://www.kansasenergy.org/wind.htm>

Fossil Energy

- **NEW PROJECT – Funded by Stripper Well Consortium – Reducing Water Production in Mississippian Reservoirs using Gelled Polymer Systems – TORP**
- **Control of Water Production Using Disproportionate Permeability Reduction in Gelled Polymer Systems – TORP**
- Analysis of critical permeability, capillary and electrical properties for Mesaverde tight gas sandstones for western U.S. (DOE) -- KGS
- Evaluating Pore Architecture and Initial Saturation on Wettability and Relative Permeability in Heterogeneous, Shallow-Shelf Carbonates (DOE) -- KGS
- Integrated Subsurface Processing of Landfill Gas and Carbon Sequestration: Collaborative project with Oak Ridge National Lab, Deffenbaugh Industries and Kansas City LFG, LLC – KGS

- Using Biosurfactants Produced from Agricultural Process Waste Streams to Improve Oil Recovery in Fractured Carbonate Reservoirs – J. Liang, C&PE
- Improved Geologic and Engineering Models of Midcontinent Fracture and Karst-Modified Reservoirs Using New 3-D Seismic Attributes – KGS & U of Houston
- Field Demonstration of Carbon Dioxide Miscible Flooding in the Lansing-Kansas City Formation - Central Kansas:
<http://www.kgs.ku.edu/CO2>
- Linked Energy Systems -- Co-generation, Ethanol Production and CO2 Enhanced Oil Recovery
<http://www.kgs.ukans.edu/PRS/Poster/2002/2002-6>
- Polymer gelled systems in IOR
<http://www.kgs.ku.edu/PTTC/gel/>
<http://www.torp.ku.edu/research/research-gel.html>
- Hugoton Asset Management Project –
<http://www.kgs.ku.edu/HAMP>
- Coal-bed methane – distribution, gas composition, fracture detection
<http://www.kgs.ku.edu/PRS/publication/2003/ofr2003-27>
- Coal Bed Methane Project -
<http://www.kgs.ku.edu/CBM>
- Shallow gas storage issues
<http://www.kgs.ukans.edu/Hydro/Hutch/>
- Cost-efficient 3-D seismic modeling; fracture detection
<http://www.kgs.ku.edu/PRS/publication/2000/ofr84>
- Evaluating targets for horizontal drilling
<http://www.kgs.ku.edu/PRS/publication/OFR9922/horzdrill.html>
- Syngas and gas to liquids using catalysts

Basic Energy Research

- Super-conducting materials
- Non-invasive collider beam monitoring (high-energy physics)
- Energy Analysis (S. White, Asst. Sci., KU ERC)

Energy Informatics and Technology Transfer

- Kansas Energy Information Network (KEIN) -- www.kansasenergy.org
Broadening the base for energy studies between Regents Institutions and Kansas Corporation Commission (funded by KCC Energy Office)
- MIDCARB -- Midcontinent Interactive Digital Carbon Atlas and Relational DataBase, <http://www.midcarb.org/>
- NATIONAL CARBON Sequestration Database and Geographic Information System (NATCARB) - <http://www.natcarb.org/>
- GEMINI – Geo-engineering Modeling through INternet Informatics
<http://www.kgs.ukans.edu/Gemini>
- North Midcontinent Region PTTC -
<http://www.kgs.ukans.edu/PTTC>

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