



Annual Report 2008

LSU

Center for Energy Studies

In service to the state in a time of crisis

During a year of national and international economic crises, with energy security and innovation a focus of the national agenda, and in the midst of a devastating state budget shortfall directly affected by the price of oil, the

work carried out by the Center for Energy Studies and its reporting units has never been more relevant. The same can be said for the Center's role within LSU, which recently secured its position as a national leader in energy research when Chancellor Michael V. Martin was named to the Energy Initiative Advisory Committee of the National Association of State Universities and Land-Grant Colleges—a committee formed to “maximize and advance the contributions of public research universities to the energy independence effort.” Adding to the University's high profile in energy-related research was its recent designation as an Energy Frontier Research Center, a program sponsored by the U.S. Department of Energy and led by Professor James Spivey and the Cain Department of Chemical Engineering. The \$12.5 million in federal funds will support a team of LSU engineers and scientists as they study “the conversion of fossil fuels to usable energy on the molecular and atomic scales.” In addition to the global energy upheaval, in the fall of 2008, Hurricanes Gustav and Ike struck our coast, leaving the energy infrastructure damaged and putting further demands on the research and outreach efforts of the Center.

In late spring 2009, the Center finds itself in the peculiar predicament of serving a vital role within the state, in service to its industry, government, and citizens, while, along with the rest of the University, facing budgetary reductions that threaten productivity and effectiveness. A review of the Center's work for the year 2008 reveals a solid record of leadership in the field and evidence that we are prepared to respond to new imperatives and opportunities whatever the fiscal environment.

The Center's six full-time faculty performed research on two dozen externally-funded projects and published 28 articles and reports. Among these are a timely update and analysis of the state's greenhouse gas inventory and its readiness to respond to pending federal environmental legislation; an assessment of the Gulf of Mexico

region's labor and port infrastructure needs; a study of the hydrocarbon potential of the North Louisiana Salt Basin; and an examination of alternative uses for existing offshore GOM structures, including artificial reefs, wind power, and enhanced oil recovery.

With its spring Alternative Energy conference and fall Energy Summit, the Center again provided a forum for state and regional energy stakeholders to learn from leaders in the industry, engage in debate, and network. Early in the year, the Center launched its Energy Leadership Speaker Series, which invites notable energy and petrochemical industry leaders to campus with the goal of sparking student interest in careers in the field.

In 2008, the staff of the Louisiana Geological Survey published its sought-after Oil and Gas Field Map of Louisiana in conjunction with the Louisiana Department of Natural Resources, as well as a new publication series on state parks and lands. Before, during, and after the landfall of Hurricane Gustav September 1, LGS staff provided technical support and produced mapping products for use by state and federal emergency organizations.

The Louisiana Applied and Educational Oil Spill Research and Development Program (OSRADP), which annually underwrites more than a dozen peer-reviewed research projects, sponsored research including on-site identification of oil-contaminated soils; a forecast model for oil spill trajectories along the Louisiana coast; and monitoring the toxicity of dispersed oils in certain types of oysters. In October, the OSRADP co-hosted the Applied Research for the Spill Response Community symposium in San Antonio.

The University's Radiation Safety Office approved use of radiation or radioactive materials for projects funded for a total \$62.6 million. In addition to enforcing safety regulations, the RSO sponsors its ongoing “Selected Topics in Radiological Protection” course to teach scientists and technical personnel best practices of radiation protection.

This report provides a summary of each unit's activities for the year. Project details, publications, and news items can be viewed at the respective Web sites.

Center for Energy Studies

www.enrg.lsu.edu

Allan G. Pulsipher · Executive Director

Outreach & Education

In 2008, the Center for Energy Studies continued its outreach and education efforts by planning and participating in both internal and external programs, including workshops, conferences, and seminars. CES staff responded to numerous media requests and public inquiries for information on energy issues, including oil and gas exploration and production technology, developments in alternative energy, and environmental and energy policy.

The Energy Information and Data Division provided energy information and analysis that responded to the needs of the legislature, public agencies, and business and civic groups. The Center maintains unique energy databases and is the official repository of energy information from the state and The Energy Council.

In December, the Center played a large role in planning the United States Association for Energy Economics /International Association for Energy Economics (USAEE/IAEE) North American Annual Conference in New Orleans. Wumi Illedare, director of the CES Energy Information and Data Division, served as the 2008 president of USAEE and general conference chairman. He also served as moderator for several sessions during the four-day event and provided presentations on “The Economics of Offshore Petroleum Lease Development and Energy Security and Geopolitics.” Center faculty and staff assisted in identifying speakers for the conference and coordinated many of the logistics associated with a major professional association event. David Dismukes served as a co-chair and primary coordinator for the conference. Research associate Jordan Gilmore organized a tour of the reconstruction activities in New Orleans’ Lower Ninth Ward with emphasis on reconstruction efforts that incorporate renewable energy and energy efficiency applications. Research associate Christopher Peters presented “An Empirical Analysis of Differences in Interstate Oil and Natural Gas Drilling Activity,” a report cowritten by Peters, David Dismukes, and Mark Kaiser. The event was the association's most successful in terms of attendance and sponsorship.

Mike McDaniel, professional-in-residence, serves as the executive director of the Baton Rouge Clean Air Coalition and is a member of the Domestic Energy Security Development Task Force for the America’s Energy Coast initiative (by the America’s Wetlands Foundation). He is also a member of the Department of Environmental Quality’s Statewide Ozone Task Force and its Mobile/Fuels Committee. In June, McDaniel hosted a seminar and field trip with Denbury Resources for local energy/environmental interests and LDNR concerning CO₂-enhanced oil recovery. In the fall of 2008, at the request of DEQ, McDaniel convened an



David Dismukes (left) and USAEE president Wumi Illedare chaired and moderated sessions for the joint North American conference of the USAEE and IAEE in December.



emergency meeting of the Clean Air Coalition and other state agencies to address fuel waiver and ozone attainment issues following Hurricane Ike. In October, McDaniel and research associate Lauren Stuart hosted a demonstration of rideshare software for LSU and city representatives with the goal of garnering interest in a campus- and city-wide effort to reduce traffic congestion and emissions. In November, McDaniel delivered a presentation to America's Energy Coast on alternative energy developments with emphasis on Louisiana.

In September, David Dismukes, CES associate executive director, testified before the Senate Republican Conference on offshore drilling in the restricted areas of the Outer Continental Shelf. He provided expert testimony to the Louisiana Tax Commission on replacement costs, depreciation, and useful lives of oil and gas properties and gave an update on market and regulatory issues affecting Louisiana's alternative energy initiatives at the Statewide Clean Cities Coalition Conference. Dismukes also testified before the Alabama legislature on the pros and cons of changing the state's severance tax rates and methodologies. On campus, he was invited to lecture before an LSU Honors College class on the importance of the oil and gas industry to the Louisiana economy.

As director of the Petroleum Technology Transfer Council, Don Goddard coordinated 10 workshops on oil and gas technology topics throughout the year. Workshops were held in Louisiana, Mississippi, and Alabama. Goddard also responded to numerous public requests for information on compressed natural gas technology, drilling costs in north and south Louisiana, the geology of the Tuscaloosa Marine and Haynesville shale, and Wilcox and Frio sandstone reservoir data.

Mark Kaiser, director of Research & Development, responded to frequent requests for information from media and industry on refining issues, offshore decommissioning, offshore redevelopments, coal gasification technology, hurricane impacts, and service vessels.

Earlier in the year, CES executive director Allan Pulsipher was named to the National Petroleum Council, an advisory committee to the U.S. Secretary of Energy. The council, in existence since World War II, responds to requests from the Secretary of Energy for analysis and guidance on energy matters involving oil and gas.

In 2008, CES staff responded to requests from a variety of individuals and institutions for specialized energy data and information, including:

hurricane impacts

refining issues

offshore redevelopments

coal gasification technology

service vessels

drilling technology and costs

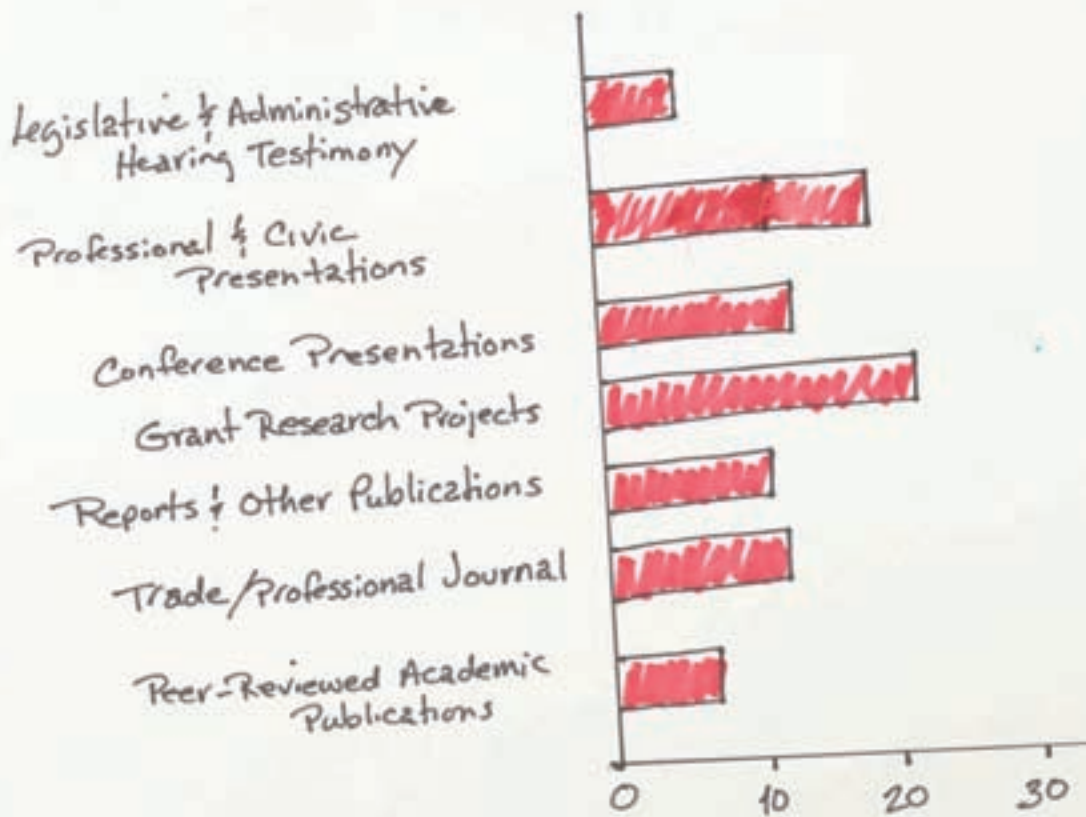
natural gas plays

unconventional oil & gas

environmental policy

renewable energy

CES Faculty Activities for 2008



Speaking Engagements

CES researchers are sought-after speakers. In 2008, the faculty presented papers and reports at more than 30 conferences, meetings, hearings, and workshops. David Dismukes' topics included market and regulatory issues in alternative energy and the impacts of the 2005 hurricanes on Gulf Coast energy infrastructure. Don Goddard gave several presentations on the Bossier-Haynesville Shale of the North Louisiana Salt Basin. Wumi Iledare spoke at international events on petroleum-based economies and global petroleum supply. Mike McDaniel gave presentations throughout the year on topics such as carbon trading opportunities in Louisiana, energy security, climate change, and the future of ethanol. Several presentations are available on line at www.enrg.lsu.edu/presentations.

On the right are some of the events at which CES faculty were invited to share their research and expertise.

CES Faculty Presentations 2008

David Dismukes

U.S. Association for Energy Economics/International Association for Energy Economics North American Conference · NEW ORLEANS, LA

American Chemical Society National Meetings · NEW ORLEANS, LA

Atmos Energy Regional Management Meeting, Louisiana and Mississippi Division · NEW ORLEANS, LA

Praxair Customer Seminar · HOUSTON, TX

Statewide Clean Cities Coalition Conference: Making Sense of Alternative Fuels and Advanced Technologies · NEW ORLEANS, LA

Don Goddard

U.S. Oil & Gas Summit · NATCHEZ, MS

Society of Independent Professional Earth Scientists · NEW ORLEANS, LA

Gulf Coast Association of Geological Societies · HOUSTON, TX

Baton Rouge Geological Society · BATON ROUGE, LA

PTTC Workshop presentations · SHREVEPORT, LA · JACKSON, MS

Kiwanis Club · BATON ROUGE, LA

Wumi Iledare

U.S. Association for Energy Economics/International Association for Energy Economics North American Conference · NEW ORLEANS, LA

IAEE International Conference · ISTANBUL, TURKEY

NAEE/IAEE Annual Conference · ABUJA, NIGERIA

Mike McDaniel

Statewide Clean Cities Conference · NEW ORLEANS, LA

Joint Louisiana Chemical Association/Louisiana MidContinent Oil & Gas Association Environmental Management Meeting · BATON ROUGE, LA

Ag Extension Service Carbon Trading Opportunities in Louisiana Conference · ALEXANDRIA, LA

API Southern Region/State Working Groups Spring Conference · CHARLESTON, SC

Capital Region Planning Commission · PORT ALLEN, LA

St. Charles Economic Development Council · ST. CHARLES PARISH, LA



Petroleum Technology Transfer Council

The Petroleum Technology Transfer Council (PTTC) provides practical information to an integral sector of Louisiana's economic base, independent oil and gas companies. Of the more than 2,500 people who have attended one or more workshops, about 75% are from industry, the remaining from state agencies or academia. Workshops have been held in the Gulf South region from Jackson, Mississippi, to Houston, most frequently in Shreveport and Lafayette.

PTTC hosted 10 workshops in 2008:

- **January:** Natural & Anthropogenic Subsidence Impact on Louisiana Coasts Symposium, Baton Rouge
- **February:** Deep Gas Reservoir Play, Central and Eastern Gulf, Jackson, Miss.
- **April:** Oil & Gas Technology Summit, Natchez, Miss.
- **May:** Little Cedar Creek Case Study, Jackson, Miss.
- **June:** Enhanced Oil Recovery and CO₂ EOR, Shreveport
- **July:** Microbial Reservoir Play, Central and Eastern Gulf, Shreveport
- **August (3 locations):** Sequence Stratigraphy and Its Application to Petroleum Exploration in Onshore Mesozoic Salt Basins Gulf Coastal Plain, New Orleans, Jackson, Miss., & Tuscaloosa
- **September:** Bossier-Haynesville Shale, North Louisiana Salt Basin: Geological and Geochemical Characterization, Shreveport

More than 80 PTTC workshops have been presented since the first "Problem Identification Workshop" in Lafayette in 1994. From "Using the computer and the Internet" in 1996, to the geology of the Haynesville shale in 2008, workshop topics are timely and in demand.

Responses to Media Requests

CES staff respond regularly to requests for interviews from local, state, regional, national, and international media. In 2008, our researchers were interviewed by *New York Times*, *Wall Street Journal*, *Indianapolis Star*, *Megawatt Daily*, *Restructuring Today*, *The Baton Rouge Advocate*, *New Orleans Times-Picayune*, *Lafayette Daily Advertiser*, *Baton Rouge Business Report*, *New Orleans City Business*, *Houston Chronicle*, *Mobile Press-Register*, *Dow Jones Newswire*, *Associated Press*, *Reuters*, *Platts*, *Trade publications*, *Italian radio*, *Local TV news (WBRZ, WAFB)*

On the Web

www.engr.lsu.edu

The Center's updated Web site offers the public access to staff presentations, past and present research reports, and publications. The Energy Data page provides access to CES-collected energy data and links to Louisiana energy data sources. The online Research Notes series addresses current Louisiana energy industry and environmental issues. CES annual reports, newsletters, and press releases are easily accessed from the home page.



Conferences

www.enrg.lsu.edu/conferences

In 2008, the Center hosted its annual **Alternative Energy** conference, dedicated to the development of renewable energy sources, and **Energy Summit**, the fall conference addressing traditional hydrocarbon issues. Alternative Energy 2008 addressed the challenges inhibiting the development of noncarbon-producing energy solutions. Speakers addressed the government's role in the development of alternative energy sources, new concepts and technical advancements in renewables development, opportunities in the state for alternative energy, and an overview of environmental markets.

Energy Summit addressed the controversial topic of energy independence, calling into question the effectiveness of ethanol in cutting oil imports, providing an outlook for natural gas production, and outlining the global credit crisis and its effects on U.S. and global energy demand, capital spending, and alternative energy. The 2009 Energy Summit is scheduled for October 28.

The 2008 conferences attracted an average of 100 participants from local, regional, and national companies, agencies, and organizations, including:

Louisiana Legislature

La. Department of Economic Development

La. Division of Administration

La. Department of Natural Resources

La. House Committee on Natural Resources

La. Office of Mineral Resources

La. Offshore Terminal Authority

La. Public Service Commission

U.S. Department of Agriculture

Alliance for Affordable Energy

Chevron

ConocoPhillips

Entergy-Tulane Energy Institute

ExxonMobil

Marathon Petroleum

Praxair

Sierra Club

Southern Strategy Group

Suez Energy North America

The Dow Chemical Company

TransCanada

URS Corporation



The fall 2008 Energy Summit, which addressed U.S. energy independence, attracted representatives of more than 50 local, regional and national companies, agencies, and organizations.



The Center expresses its gratitude for the continued support of its conference sponsors.

Platinum

- Chevron
- ConocoPhillips
- The Dow Chemical Company
- ExxonMobil
- Louisiana Department of Natural Resources
- Petroleum Technology Transfer Council
- Suez Energy International
- U.S. Association for Energy Economics

Gold

- American Electric Power
- F. Malcolm Hood & Associates
- Kean, Miller, Hawthorne, D'Armond, McCowan & Jarman, LLP
- Louisiana Economic Development
- Premier Industries
- Southern Strategy Group
- TransCanada

Energy Leadership Speaker Series (ELSS)

www.enrg.lsu.edu/elss

Launched in spring 2008, the quarterly Energy Leadership Speaker Series invites current and former energy industry leaders to share their experiences and knowledge of the industry with the LSU community and the general public. In particular, the forum provides a unique opportunity for students interested in energy-related careers or research to interact with industry representatives, including executives, policymakers, and regulators. ELSS speakers for 2008 included Oliver G. "Rick" Richard, chairman of CleanFUEL USA; Chris John, president of the Louisiana Mid-Continent Oil and Gas Association; and Barry E. Davis, president and CEO of Crosstex Energy.



The quarterly Energy, Leadership Speaker Series brings to campus energy industry executives, often distinguished LSU alumni like CleanFUEL USA chairman Rick Richard.

Scholarships

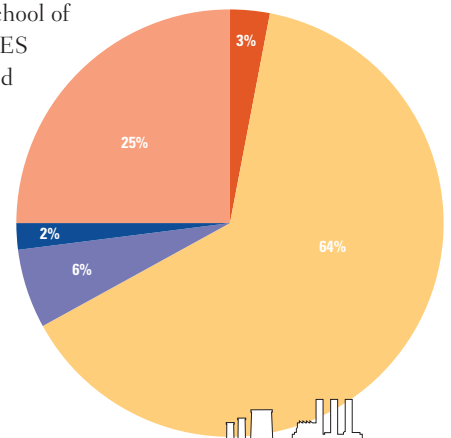
Upon learning of the illness of long-time Center supporter and mentor F. Malcolm Hood, who passed away January 22, 2009, the Center initiated a scholarship fund in his honor. The F. Malcolm Hood, Jr. Scholarship will benefit deserving students in energy-related disciplines. The Center staff wish to thank all who contributed to the fund.


The Center awarded its Robert R. Brooksher /LMOGA Scholarship to junior geology major Jesse Landreneau of Carthage, Texas, and senior geology major Jessica Mumphrey of Baton Rouge. The scholarship is named for the late Robert R. Brooksher, Jr., who was executive vice president of Louisiana Mid-Continent Oil and Gas Association and a founding member of the LSU Center for Energy Studies' Advisory Council. The \$500 award, intended to be applied toward the purchase of books, is given to a junior or senior in an energy-related discipline based on academic credentials.

CES Conference Center

During 2008, the Woods Auditorium, rotunda lobby, and conference room were venues for 267 events. In-house use accounted for over 70 percent of the meetings held in the center (the School of the Coast and Environment hosted 171 events, CES hosted 17, and Louisiana Geological Survey hosted six). Other LSU unit events represented 25 percent; and non-LSU organizations scheduled 3 percent of the events held.

- School of Coast & Environment
- Center for Energy Studies
- Louisiana Geological Survey
- Other LSU Units
- Non-LSU Organizations



A large offshore oil rig is silhouetted against a bright sunset over the ocean. The sun is low on the horizon, creating a strong glow and reflecting on the water's surface. Other smaller rigs are visible in the distance.

Research

In 2008, CES faculty performed research on timely energy issues of vital importance to the state and region. Projects were funded by the U.S. Department of the Interior, Minerals Management Service, the LSU Coastal Marine Institute, the U.S. Department of Energy, the American Association of Petroleum Geologists, the Louisiana Department of Natural Resources, the Louisiana Department of Economic Development, the Venice Port Coalition and Plaquemines Parish. Listed below are a few of the ongoing projects. A complete listing and full project descriptions are available at www.enrg.lsu.edu/view/projects

Assessment of Opportunities for Alternative Uses of Hydrocarbon Infrastructure in the Gulf of Mexico. Mark Kaiser and Allan Pulsipher. Funded by the U.S. Department of the Interior, Minerals Management Service and the LSU Coastal Marine Institute.

This project examines four alternative uses of offshore structures in the Gulf of Mexico Region: artificial reefs, wind power, mariculture, and geologic sequestration/enhanced recovery. It will also consolidate, review, and synthesize the economic, environmental, political, technical, socioeconomic, and regulatory issues that frame each alternative.

Basin Analysis and Petroleum System Characterization and Modeling, Interior Salt Basins, Central and Eastern Gulf of Mexico. Don Goddard and Ron Zimmerman in conjunction with Ernest A. Mancini and the University of Alabama. Funded by the U.S. Department of Energy.

Researchers have modeled and characterized the petroleum-rich formations in two of the most important provinces in North America for oil and gas accumulations: the North Louisiana Salt Basin (which covers portions of Louisiana, Arkansas and Texas) and the

Mississippi Interior Salt Basin in the northeastern Gulf of Mexico region. Information from the research has provided an advanced approach for targeting geologic "traps" where oil and natural gas may have collected. The models will be directed at aiding future exploration efforts for petroleum buried below 15,000 feet, well below the depth of most ongoing operations today. Research will concentrate on Jurassic and Lower Cretaceous source rocks and reservoirs.

Factors Affecting Global Petroleum Exploration and Development and Impacts on the Attractiveness and Prospectivity of the U.S. Gulf of Mexico Deepwater.

Wumi Iledare. Funded by the U.S. Department of the Interior, Minerals Management Service and the LSU Coastal Marine Institute.

The attractiveness of a region for E&P investment depends upon the perception of its prospectivity, which broadly speaking, refers to the technical attributes (source rock, reservoir, cap rock, etc.) as well as legal and fiscal arrangements for the commercial exploitation of the petroleum resources. This study examines resource growth, technical discovery success, and exploration efficiency to assess the attractiveness and prospectivity of the U.S. Gulf of Mexico deepwater and the deep shelf. The research will also assess the effectiveness of regulatory programs, fiscal incentives, and technology progress on OCS deepwater investment attractiveness or investment climate.

Preparing Louisiana for the Possible Federal Regulation of Greenhouse Gases.

Mike D. McDaniel, Funded by the Louisiana Department of Economic Development.

The purpose of this project is to help prepare Louisiana for the possible federal regulation of greenhouse gases (GHG) and to assure that the state's economic competitiveness is not compromised and that economic development opportunities are recognized. The four project elements include a comprehensive state-wide GHG inventory; a thorough review of measures being taken or contemplated by other states to accommodate expected federal GHG regulation or climate change concerns; a high-level assessment of the impacts of the most likely federal GHG regulatory schemes on Louisiana's economy; and a list of potential state and industry strategies for responding to requirements and opportunities brought by federal GHG regulation.

Understanding Current and Projected Gulf OCS Labor and Port Infrastructure Needs.

David Dismukes and Allan Pulsipher. Funded by the U. S. Department of the Interior, Minerals Management Service and the LSU Coastal Marine Institute.

This project will perform both a labor needs analysis and a ports infrastructure needs analysis. The primary component of analysis for both of these sub-projects will be a workshop series to explore, scope, and seek input and conclusions on numerous important issues facing the offshore industry in both its labor and port infrastructure needs and requirements. The labor needs portion of this analysis will be structured to lay an important framework for examining these issues, among others, relative to the labor needs in the GOM region that support offshore activities. The port infrastructure needs analysis will explore the challenges facing ports and supply bases along the GOM from a comprehensive and interactive basis.

Formed in 1979 as one of 31 U.S. Department of Interior State Mineral Institutes, the Minerals Processing Research Division coordinates research and public service programs in process research and technology transfer; sustainable development; energy management; and inherently safer design.

Carbon Capture, Algae Focus of Minerals Processing Research Division

CES's Minerals Processing Research Division (MPRD), headed by Ralph Pike, is currently exploring carbon capture from power plants and development of new processes based on renewable resources that supply the same products as current plants. In December 2008, the National Energy Technology Laboratory of the Department of Energy awarded a \$1.1 million competitive grant with \$277,000 in cost sharing for a total of \$1.37 million to the MPRD and TDA Research, Inc. of Denver, Colorado. TDA Research has discovered an adsorbent for carbon dioxide that functions at the temperature of combustion gases generated in power plants. Laboratory tests have demonstrated its effectiveness for removing carbon dioxide from these gases that are now being released to the atmosphere. The MPRD will use the laboratory data provided by TDA Research to design an adsorption process to remove carbon dioxide from power plant combustion gases and regenerate the adsorbent. TDA Research will use this



Algae, shown here growing at the Redhawk power plant near Phoenix, have been reported to absorb carbon dioxide and produce 5,000 gallons of biodiesel an acre each year (Sengupta and Pike, 2009).

design to build and test a pilot scale version of the process. The design will be optimized by the MPRD based on the pilot plant tests, and a full-scale plant will be built and tested on a power plant by Babcock & Wilcox.

The MPRD continues its research efforts in the transitioning of existing plants to ones using biomass feedstocks that require nonrenewable resource supplements. Algae are an important potential source of oil and carbohydrates for chemicals. Yields of 15,000 gallons/acre-year of oil have been obtained from algae. Compare this to 60 gallons/acre-year for soybeans. Algae can be grown on power plant exhaust, and having high growth rates, can be harvested daily. GreenFuel Technologies has developed a process that grows algae in plastic bags using CO₂ from power plant

exhaust. The system does not require fertile land or potable water. Water used can be recycled, and waste water can be used. Research is underway to determine the best species of algae for oil production and the best method of extracting the oil. Ralph Pike and graduate assistant Debalina Sengupta have prepared a white paper, "Integrating Biomass Feedstocks into Chemical Production Complexes using New and Existing Processes." The White Paper is available on the Mineral Processing Research Division's web site, www.mpri.lsu.edu.

Continuing Education for Professional Engineers

The MPRD maintains an extensive Web site (www.mpri.lsu.edu) that provides continuing professional development self-study courses for professional engineers' PDH requirements. Also available on the Web site are research results, including journal articles, conference proceeding, technical reports, theses, dissertations and computer programs. The programs have installation files that can be downloaded and used on an individual's computer. Included with the programs are users' manuals and tutorials. These programs have been developed using actual plants, and the process models can be applied to comparable plants.

Technology Transfer

Two technologies that provide immediate and substantial energy savings for chemical plants and refineries are "pinch technology" and "on-line optimization." Large companies have corporate level groups that routinely apply pinch technology and on-line optimization. Small to medium sized chemical companies in Louisiana do not have the trained personnel needed to apply this technology. The MPRI provides these short courses on request.

Louisiana Geological Survey

www.lgs.lsu.edu

Chacko John · Director



LGS geologists and cartographers produced three dozen publications last year, including the *Oil and Gas Field Map of Louisiana* and a new publication series on state parks and lands. For available publications, visit www.lgs.lsu.edu

In 2008, the Louisiana Geological Survey, under the direction of State Geologist Chacko John, continued to successfully carry out its mission of providing unbiased geological and environmental information to promote environmentally sound economic development of energy, mineral, and water resources of the state. LGS research faculty and staff were involved in 13 ongoing projects funded by agencies including the U.S. Geological Survey, the Louisiana Department of Natural Resources, Louisiana Oil Spill Research and Development Program, the Louisiana Department of Transportation and Development, Stanford University, Gulf South Research Corporation, and Rowen Township, Pennsylvania.



Development of digital pipeline data is crucial for effective energy planning, environmental monitoring, disaster prevention, and emergency preparedness.

Digital Pipeline Data Aids Emergency Planning, Response

The project “Research and Development of a Geographic Information System (GIS) of Petrochemical Pipelines between Baton Rouge and New Orleans, Louisiana” is intended to supplement emergency response and planning for possible hazardous materials spills emanating from petrochemical transmission pipelines (typically those with diameters greater than 4 inches) that crisscross the area between Baton Rouge and New Orleans. LGS mapped a

total of 6,202 miles of pipelines for 67 pipeline operators in this study area. These data contain vital information on the commodities transported through the pipeline and are designed for use for first responders as well as planners, pipeline contractors, and the petroleum industry.

Tuscaloosa Research Strikes Pay Dirt

LGS research and publication on the Tuscaloosa Marine Shale in 1997, which is the only scholarly article on the subject, has now resulted in the successful exploration of this play in Florida Parishes and Mississippi. Currently, there is successful drilling activity in the play, which will result in increase of revenues to the state. The publication, “An Unproven Unconventional Seven Billion Barrel Oil Resource—the Tuscaloosa Marine Shale,” is much requested and referred.

LGS Tracks Coal Bed Methane Drilling

Lignite and associated Coal Bed Methane (CBM) in the Paleocene-Eocene Wilcox Formation are subjects of continuing research at LGS. Through ongoing maintenance of an electronic database of all CBM wells in the state, LGS tracks the number of wells drilled in Louisiana that specifically target CBM. Information for the database is generated primarily from reports on the Louisiana Department of Natural Resources’ SONRIS online database system. A base map of all CBM locations in Louisiana is being prepared. The work is done under a contract with the University of Louisiana – Lafayette.

Geologic Review Recommends Environmentally Safe Alternatives

Under the direction of John E. Johnston III, Geologic Review evaluates geology, engineering, lease, and site-specific data, and occasionally economic data, associated with oil and gas permit applications submitted to the Coastal Management Division (CMD) of the Louisiana Department of Natural Resources and to three districts of the U.S. Army Corps of Engineers (USACE). Applications are reviewed to determine environmental impact to wetlands or other environmentally sensitive areas and to recommend less-damaging alternatives, including reducing the size of ring levees and slips, reducing the length of board roads and canals, the use of directional drilling, and the use of alternate and less-damaging access routes that allowed the well to be drilled while avoiding or minimizing any environmental damage involved. During 2007-2008, based on data submitted by CMD and USCAE from issued permits, Geologic Review’s search for less-damaging alternatives yielded positive on the length of canals and board roads requested and the overall acreage of projects requested.

Cartography Wins Fifth National Design Award

The map titled *Louisiana Shoreline Change 1937-2000*, produced by LGS for the LSU Hurricane Center, won the award for the “*Best Thematic Map of 2007*” in the professional category by the American Congress of Surveying and Mapping/American Cartographic Association in their 35th Annual Map Design Competition. This is the fifth National Map design award won by the LGS cartographers since 2000.

Program Maps Louisiana’s Surface Geology

The Geologic Mapping and Mineral Resources Section of LGS continued its investigations of surface geology under the STATEMAP component of the National Cooperative Geologic Mapping Program (NCGMP). The goal of the program is to cover the surface geology of the entire state at 1:100,000 scale in 30 x 60 minute quadrangle format. Each year LGS selects one or more 30 x 60 minute geologic quadrangles for cartographic production to be printed as a lithograph. Preliminary drafts are available for reference by members of the public.

In 2008, LGS delivered draft plots of one 30 x 60 minute geologic quadrangle (Amite) and two 7.5-minute geologic quadrangles (Hatchersville and Greensburg). These quadrangles contain Louisiana’s only known impact crater, the Brushy Creek structure, located in St. Helena Parish. This anomalous structure originally was discovered in the course of a STATEMAP project in FY 1996, and subsequently was researched by Heinrich (2003) at LGS.



Detail from the award-winning map *Louisiana Shoreline Change 1937-2000*.

LGS in Service

Emergency Support Team Activated

Before, during and after the landfalls of Hurricanes Gustav and Ike, LGS provided emergency technical support to the Governor's Office of Homeland Security and Energy Preparedness (GOHSEP). Numerous mapping products were produced for state, federal and other emergency relief and rescue agencies and organizations.

Prior to landfall, the LGS emergency support team of John E. Johnston III, R. Hampton Peele, Thomas van Biersel, Marty Horn, and Richard McCulloch provided assistance with impact, rainfall, flood and storm surge estimates. During and after the hurricanes, the team provided search and rescue maps with surge model data; locations of "sheltered in place" hospitals, nursing homes, and adult care facilities; maps of emergency evacuation routes with points of distribution for emergency supplies and generators; maps depicting the locations of Red Cross shelters; military base maps for field damage assessment; and latitude and longitude coordinates of specific features upon request. Much effort went into locating and mapping open gas stations for the governor's office.

The LGS has provided emergency technical support to the state since the early 1980s. When a crisis is imminent, an LGS team is detached from regular duties and reports to the state Emergency Operations Center.

Staff Active in Local, National Geological Organizations

LGS staff continues to be active participants in local and national professional societies.

LGS faculty and staff
respond to queries from citizens, industry, state agencies, and other cartographical organizations regarding geological and cartographical matters.



LGS emergency support teams have been commended for their emergency scientific and mapping support for search and rescue efforts for hurricanes and have been credited for their assistance in saving the lives of Louisiana citizens. Image courtesy NASA.

- Doug Carlson, John Johnston and Thomas Van Biersel are President, Vice-President and board member of the Baton Rouge Geological Society (2008).
- Doug Carlson is the Gulf Coast representative for the Division of Environmental Geology (DEG) of the American Association of Petroleum Geologists (AAPG).
- Chacko John was President of the Association of American State Geologists (AAPG) for 2008 and presided over the Association Centennial celebrations held in Shepardstown, West Virginia, at the end of June.

LGS, BRGS Co-host Symposiums

LGS co-sponsored two research symposiums along with the Baton Rouge Geological Society. The January symposium “Natural and Anthropogenic Subsidence Impact on Louisiana Coasts” addressed subsidence in coastal Louisiana; fluid withdrawal’s impact on subsidence; and Mississippi River Delta Plain subsidence patterns and causes. In March, the Second Annual Louisiana Groundwater Symposium featured technical presentations on groundwater chemistry throughout Louisiana, groundwater use, resources and value in Louisiana, and analysis of Louisiana aquifers involving groundwater modeling.

The Louisiana Applied and Educational Oil Spill Research and Development Program

www.osradp.lsu.edu

Don Davis · Director

The Louisiana Applied and Educational Oil Spill Research and Development Program (OSRADP) has underwritten 10 to 15 peer-reviewed research projects annually for the past 15 years. These projects focus on a common goal: oil spill prevention and cleanup in a scientifically based efficient and practical manner using the best techniques available, with approval from the regulatory community to meet the integral demands of an oil spill. The program's success is due, in part, to the long-term availability of dedicated research funds.

In July 2008, 10 members of the program's Advisory Board met to set the research agenda. The group agreed upon four major themes: priority research areas; suggested general topics; educational topics; and a special topic. In addition, the agenda outlined the program's protocols for funding, paying particular attention to the review process.

Because the program solicits preproposals from nearly all of the state's public universities, and not knowing the expertise available, the agenda emphasizes that each potential researcher should review the priority issues carefully, as these priority topics may not consume all of the funding. Therefore, if these nine subject areas were not within a researcher's expertise, the list was intended to serve as their guide, not as a mandate to not apply.

The priority areas of research included

- Determine the ecological effects of dispersant use in near-shore environments (out to the 10-meter depth contour), with an emphasis on ecological risk assessment in a specific geographic region in Louisiana.
- Determine the ecological effects of herders use in near-shore environments (out to the 10-meter depth contour), with an emphasis on ecological risk assessment in a specific geographic region in Louisiana.



Aerial view of oil, ship, and booms on Calcasieu River after oil release, June 25, 2006. Image courtesy National Oceanic and Atmospheric Administration/Department of Commerce.

- Develop a model that shows the dynamics of dispersant movement under a variety of conditions and can serve as a guide to dispersant use in coastal Louisiana.
- Quantify enhancements to natural resource services as a result of improved hydrology. Specifically, when normal tidal fluctuations are restored to a coastal wetland through removal of obstructions (such as levees or canal plugs), express the resulting improvements (if any) to faunal usage, faunal habitat, vegetative health, vegetative productivity, and species composition in quantifiable natural resource services.
- Quantify changes to natural resource services as a result of altered hydrology. Specifically, when riverine flows are diverted to a coastal wetland or freshwater swamp, express the resulting improvements (if any) to faunal usage, faunal habitat, vegetative health, vegetative productivity, and/or species composition in quantifiable natural resource services.
- Produce a detailed map/catalogue of the spatial distribution of submerged aquatic vegetation in coastal Louisiana, east of the Mississippi and on all of the River's main passes. This project will require considerable fieldwork since this type of vegetation cannot be classified by satellite or airborne scanner data with any degree of consistency in accuracy.
- Development of a GIS-based risk matrix using data on pipelines, orphaned wells, and 29B disposal locations that includes the age of the oil and gas infrastructure together with coastal land loss rates. The deliverable is envisioned as a tool to help decision makers prioritize infrastructure maintenance and coastal restoration projects, and to provide information about likely areas of high potential for oil and gas discharges.
- Based on current clean-up techniques and technology, what are the most efficient techniques to clean up, contain, and recover submerged oil?
- Develop an electronic-based, highly-detailed bibliography on all aspects of submerged oil.

In addition to suggested research problems, the board developed a list of 17 special topics. The following four topics from this list show the wide diversity of potential research endeavors suggested by the Board:

- Develop, coordinate, and host a one-day risk assessment workshop relative to storm events. The workshop needs to address the question: "What are the basic elements one has to consider before, during, and after a storm event?" And, "What public domain material(s) is/are available to help first responders meet their risk assessment needs?"

The OSRADP allocates funds to the state's university-based scientists, with the goal of encouraging applied research of the highest quality. The current challenge is to move completed research off the shelf and into the field.

- Determine of the rate of recovery for oiled habitats in Louisiana as a function of oil type, soil chemistry), plant community, and hydrologic (elevation) conditions. This research may involve evaluation of historic and new spill sites.
- Use of a remote-controlled aircraft, or other type of field work, to conduct a detailed field survey of Louisiana's seabird colonies using as a baseline data compiled and collected in a previous OSRADP-sponsored study completed in conjunction with the Louisiana Department of Wildlife and Fisheries
- Assess existing and further development of operational forecast tools to determine oil-spill trajectories under hurricanes and major storm conditions, including impact of wind, surge, and topographic features.

2007-2008 Projects

For a number of reasons, the program did not solicit proposals for the 2008-2009 funding cycle. The agenda was put on hold, but many of the projects funded last year will be completed this year. The table below identifies the projects that will be finished in 2009.

2007 - 2008 Funding Cycle Awards

(To be completed in 2009)

PI	University	Project Title
Michael Camille	ULMA	A pipeline GIS for north Louisiana.
David Weindorf	LSU	Rapid, on-site identification of oil contaminated soils using visible near infrared spectroscopy.
Seung Kam	LSU	An innovative approach of foam-assisted groundwater remediation.
Greg Stone	LSU	Oil spill trajectories along the Louisiana coast - implementation of a forecast model.
Qianxin Lin	LSU	Investigation of fundamental physiological mechanisms controlling differential tolerance of dominant marsh plant species to oil spills and development of oil stress indicators.
Gary Barbee	LSU	Biomonitoring toxicity of dispersed oils in diploid and triploid oysters.
Rob Cunningham	LSU	Enhancement, revamp and update of the LOSCO marinas and boat launch database.
Debra Dardis	SLU	The development and testing of oil and gas industry related educational materials for middle and secondary schools.

With the exception of a couple of projects that were impacted by Hurricanes Gustav and Ike, all of the researchers are on track and should complete their deliverables in 2009.

Symposium: Applied Research for the Spill Response Community

On October 27, prior to Clean Gulf's meeting in San Antonio, the OSRADP, the Texas General Land Office, and the University of New Hampshire's Coastal Response Research Center (a NOAA-sponsored oil spill research initiative) co-hosted the oil spill research symposium "Applied Research for the Spill Response Community." The attendance was excellent—the largest pre-conference event in the history of Clean Gulf—and the post-conference remarks were complimentary. The event will be held again at Clean Gulf in New Orleans, November 17-19, 2009.

OSRADP encourages educational professionals to submit proposals for "Educational Topics," including

- * Establishment of a summer internship program for high school teachers of math, science or social studies to provide opportunities to work with researchers in the oil and gas industry.
- * Presentation of summer classroom/symposiums/workshops for teachers on using the mapping, scientific methods, etc. of oil and gas industry in the classroom.



RSO manager Mary Haik carries out a regular calibration on a radiation survey meter using a cesium-137 calibrator.



Assistants Rebecca Hill and Dana Lewis count the swipes from routine radiation laboratory surveys using a liquid scintillation counter.



Radiation specialist Cade Register and technical assistant Charlie Wilson perform a leak test on a sealed radioactive source.



Radiation Safety Office

www.radsafety.lsu.edu

Wei-Hsung Wang · Director

The LSU Radiation Safety Office operates the campus internal radiation protection and control program. Authorization for LSU to possess, store, and use sources of radiation is stipulated in a broad-scope Radioactive Material License issued by the Louisiana Department of Environmental Quality (DEQ), which has vested responsibility from the United States Nuclear Regulatory Commission (NRC) within the State of Louisiana. The broad-scope license allows the University maximum flexibility in the use of sources of radiation for teaching and research activities.

Under the LSU radiation safety program, there are about 900 approved radiation workers (including 120 principal investigators) and approximately 200 radiation laboratories at LSU, the Agricultural Center (AgCenter), and Pennington Biomedical Research Center (PBRC). The authorized radiation principal investigators at LSU are from Biological Sciences, Center for Advanced Microstructures and Devices, the Cain Department of Chemical Engineering, Chemistry, Civil and Environmental Engineering, Comparative Biomedical Sciences, Electrical and Computer Engineering, Environmental Sciences, Geography and Anthropology, Geology and Geophysics, Mechanical Engineering, National Center for Biomedical Research and Training, Oceanography and Coastal Sciences, Pathobiological Sciences, Physics and Astronomy, and Veterinary Clinical Sciences.

To assure that University personnel, students, visitors, and the general public are not subject to undue radiation exposure, both personal and environmental radiation dosimeters are assigned to monitor the corresponding radiation exposure on a frequency from monthly to quarterly depending on the exposure potential and the type of radiation being monitored. The RSO examines the radiation exposure report upon receipt to determine whether or not the limits have been exceeded and, if necessary, to initiate investigation for elevated results. There are about 6,500 radiation dosimeters issued in a year.

In addition to the standard, comprehensive radiation safety training for individuals who plan to become approved radiation workers, the RSO offered 10 radiation awareness training sessions to the personnel of the Office of Facility Services (four sessions) and to the officers of the Police Department (six sessions) at LSU.

Per PM-30, approval of the RSO is required for all contracts and grants involving the uses of radiation or radioactive materials. During this fiscal year, the RSO approved 65 grant proposals for a total requested fund of 62.6 million dollars.

Operational Radiation Safety Course Continues

The RSO has sponsored a well-recognized five-day training course entitled "Selected Topics in Radiological Protection" for the past 24 years. The objective of this course is to emphasize basic concepts and practices of radiation protection to engineers, scientists, managers, and other technical personnel through classroom lectures and laboratory exercises. Attendees this year included staff from DEQ, E. I. Dupont de Nemours & Co., PCS Nitrogen Fertilizer, L.P. (the largest U.S. producer of nitric acid), and Total Safety U.S., Inc. (a global leader in providing safety service).

DEQ Inspects the LSU Campus

A radioactive material license inspection of LSU's radiation protection program for LSU, the AgCenter, and PBRC was conducted by an inspector from DEQ's Emergency & Radiological Services Division. The inspector reviewed the records of individual and area radiation exposure monitoring, inventory and leak tests of sealed radioactive sources, Radiation Safety Committee meetings, survey meter calibration, radioactive waste disposal, radiation laboratory contamination surveys, radioactive shipments, and radiation laboratory close-out surveys. The functions and applications of the Health Physics Assistant software, the spill or personnel contamination incidents, the Radiation Safety Manual, and the standard operating procedures for essential radiation safety operations were also reviewed. The inspector walked through the radioactive waste storage facilities, the areas with increased controls, and eight randomly selected radiation laboratories to check the radiation levels, calibration of survey meters, posting requirements, and security in these places. No violations were cited based on the inspector's observations, and no areas of concern were listed on DEQ's Field Interview Form.

Requirements Amended for Unescorted Access

In compliance with an order from the NRC, the DEQ amended LSU's Radioactive Material License conditions and required additional measures to determine individuals' trustworthiness and reliability for granting unescorted access to areas with radioactive materials in quantities of concern in order to enhance accountability, controls, and protection over those materials. Individuals who demonstrate a need for unescorted access shall be fingerprinted by a local law enforcement agency. The fingerprint cards are submitted to the Federal Bureau of Investigation (FBI) for identification and a criminal history records check. The review of the criminal history records from the FBI, in conjunction with revised and increased controls procedures, are used by the Trustworthiness and Reliability Official to make a determination whether to grant unescorted access to radioactive materials in quantities of concern. The fingerprinting program, which meets the new requirements, has been fully implemented.



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