Annual Report
2005 – 2006

Center for Energy Studies

Louisiana Applied and Educational Oil Spill Research & Development Program

Louisiana Geological Survey

Minerals Processing Research Institute

Radiation Safety Office

LSU

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Introduction

The Center for Energy Studies, the Louisiana Geological Survey, the Louisiana Applied and Educational Oil Spill Research and Development Program, the Minerals Processing Research Institute, and the Radiation Safety Office report as a college-level organization through the executive director of the Center for Energy Studies to the vice chancellor for research and economic development. Each unit is a separate organizational entity with its own mandates, aspirations, goals, history, and responsibilities, but the units cooperate and regularly share information and resources. None offers courses or grants degrees, although their faculty and staff frequently hold adjunct positions and teach in related academic departments.

This report summarizes the activities of these units during the past academic year, a year that began with Hurricanes Katrina and Rita—the most devastating natural disasters of our time. The massive destruction and resulting personal, social and economic dislocations Katrina and Rita brought to the Gulf Coast affected the state, the region, the university, and the activities of each of these units in major and unexpected ways.

With near-record winds and wave heights, both storms rammed through dense concentrations of platforms, pipelines, and drilling rigs in the offshore oil and gas fields before battering and flooding many of the industry's key onshore processing and transportation facilities. Louisiana's offshore oil and gas industry has been a principal focus of the research and analysis that takes place within the Center for Energy Studies for the past decade. Making use of its accumulated information and expertise, as energy prices and supplies responded to these disasters, the Center became a major source of information on the damage to the Gulf's energy infrastructure and its implications for national energy markets and prices. Faculty and staff of the Louisiana Geological Survey were extensively involved in the immediate effects of the storms, using their knowledge of the coast and unparalleled cartographic capabilities to assist those trying to plan and implement the response and recovery. The amount of oil spilled during the hurricanes approached the volume lost when the Exxon Valdez tanker ran aground in Alaska. Monitoring and analyzing the spills and the efforts to contain and mitigate them became a principal task of the Louisiana Applied and Educational Oil Spill Research and Development Program.

Overarching the effects of the natural disasters on Louisiana's citizens and economy was a hardening of a major realignment in prices and expectations in global energy markets. Apprehension about continued, spreading, political instability in major oil exporting countries; growing demand for energy in the most populous developing countries; a steadily shrinking margin of excess capacity to produce and refine oil; and the inability of most of the major oil companies to replace their reserves as rapidly as they were being produced combined to accelerate rising prices for crude oil, natural gas, electricity, and gasoline throughout the year.

Energy prices are now about double the levels experienced during the 1990s. The conventional forecast is that little will happen, or can be done, to reverse or moderate this trend. Three-dollar-a-gallon gasoline is a source of considerable irritation to consumers, especially those who have invested in heavy vehicles with modest fuel efficiency, but the expectation that three-dollar-a-gallon gasoline is a trend rather than a temporary anomaly has resurrected alternative energy entrepreneurs and ventures, as well as intensified debates about the merits, need for, and feasibility of public policy initiatives intended to encourage them.

On a more general level, the geographic and chronological near-convergence of two major hurricanes on Louisiana's coast makes clear not only how interconnected the physical well-being of Louisianans is to the natural ecological and geological processes of its coast, but how dependent Louisiana's economic performance and prospects are on the energy industries and infrastructure that have become concentrated in this unique and vulnerable geographical location.

How to best recover from unprecedented natural and economic disasters, while simultaneously adjusting to a new world of more expensive, less certain sources of traditional energy and finding ways to discern and encourage cheaper or more reliable alternatives sources (and using those we have more efficiently), provides an interesting challenge to those in the energy and energy analysis business.

Allan G. Pulsipher
Executive Director
LSU Center for Energy Studies

Center for Energy Studies

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Realizing Louisiana's Unique Biofuels Opportunity

Although three-dollar-a-gallon gasoline is a source of concern and irritation to consumers and their elected representatives, the expectation that it will endure has resurrected interest in using crops, wastes, and other biological sources to produce suitable "alternative" biofuels, and, at the same time, made the production of conventional fossil fuels more profitable. For the foreseeable future, fossil fuels will remain the principal energy source, and almost all biofuel production will be combined as additives or supplements with conventional fuels to close the gap between a mature sluggish supply and a growing global demand. If the price of conventional fuels remains at current high levels, biofuels' share will grow, but fossil fuel will predominate for at least the next two or three decades. How well biofuels can be adapted and integrated into the fossil fuel infrastructure will be an important determinate of the speed and significance of their contribution to the nation's energy supply.

Both geographically and economically Louisiana is situated so as to be disproportionately affected by the integration of biofuels into the energy supply.

Geographically, from the South, the state includes the major energy corridor through which much of the crude oil and natural gas enters the country and much of the nation's transportation network of pipelines as well as its refining and processing facilities are concentrated. From the North, the Mississippi River system is the transportation corridor and Louisiana the point of embarkation for much of the nation's bulk agricultural production shipped from the Midwest.

Economically, processing, transforming, and transporting oil and gas supplies and products is the core of Louisiana's industrial economy. Those industries primarily involved and the host of service companies that support them comprise a considerable part of the foundation for the high-wage component of the state's economy. Another large part of the foundation is the petrochemical industries that are dependent on affordable supplies of hydrocarbons not only for energy but as feed stock.

The Center for Energy Studies (CES) conducts, encourages, and facilitates research and analysis to address energy-related problems or issues affecting Louisiana's economy, environment, and citizenry. Whether conducted by its staff or by others it supports, CES' goal is to provide a balanced, objective, and timely treatment of issues with potentially important consequences for Louisiana.

Biofuel production on the scale necessary for commercial success is a sophisticated and demanding technical process requiring many of the technologies and skills used to produce fuels from traditional sources. Louisiana's workforce and store of human capital is motivated and well qualified to contribute toward blending biofuels into the nation's energy supply and infrastructure. The work experience and hands-on skills of Louisiana's refinery operators, industrial construction workers, pipeline operators, logistical coordinators, material schedulers, environmental managers, etc., represent a unique human resource advantage for the state. Finally, state and local governments in Louisiana have a record of responsible regulation of and support for energy-related industrial activity.

A strategic location; an extensive, globally competitive processing, refining, and transportation infrastructure; technical, managerial, and operation workforces with uniquely relevant experience and transferable skills; and a supportive regulatory and governmental climate give Louisiana a comparative advantage in biofuels. The Center is working with the University's Office

This variety of "Energy Cane," L 79-1002, was developed by the LSU AgCenter as a biofuel source. Photo: B. L. Legendre, LSU AgCenter.

of Research and Economic Development, the Department of Chemical Engineering, the Department of Biological and Agricultural Engineering, the College of Basic Sciences, and others to find ways that LSU can help realize this potential.

The efforts range from immediate applied research to quite basic long range research. For example:

- Initial discussions have been held with LSU concerning the feasibility of establishing a Biofuels Research Center at a location adjacent to a recently announced planned biofuels complex in Baton Rouge. The Research Center would test and conduct research for the biofuels complex as well as similar facilities on a non-proprietary basis and have the ability to test biofuels technology and equipment on a commercial rather than merely bench scale basis.
- A number of petrochemical and chemical plants along the Gulf coast are either being mothballed or closed because of increased natural gas prices. In particular, several ammonia plants are not economically viable to operate, but there are opportunities to redesign and convert them to bio- and alternative fuels manufacture. Chemical engineering faculty, in concert with CES and MPRI, has been exploring these possibilities from economic and scientific perspectives.
- A strong group of scientists in LSU's College of Basic Sciences is working on eukaryotic, bacterial, and archebacterial organisms and their biochemical pathways. The group is interested in organisms living in extreme environments and the biochemical pathways that allow this to occur, as well as advances in the enzymatic pathways, and the gemonics, proteomics, and metabolomics that might be employed to improve plant yields, and microbial (industrial) fermentation processes.
- At LSU's Agricultural Center research projects that directly relate to this collaborative opportunity include development of a comprehensive inventory of bio-based resources for the state of Louisiana, the conversion of cellulosic components of sugarcane to bio-fuel; improved gasification and drying technologies for woody and animal waste biomass; evaluation of cultivars with increased energy potential; and evaluation of economic characteristics of bio-energy approaches and infrastructure.

Louisiana is by far the most energy intensive state measured in terms of energy consumed per dollar of gross state product produced. This economic foundation was hit hard by Katrina and Rita at a time it was especially vulnerable because of record-high energy prices and uncertain supplies. Biofuels development could be an important factor in determining how much of the state's energy-dependent industrial base will be rehabilitated and retained, as well as a badly needed impetus for growth in hurricane damaged communities.

As oil prices have escalated many biofuel enterprises have emerged, but most are relatively small scale, "mom and pop" enterprises dependent on subsidies and using decades-old technology. Conversion of existing petrochemical facilities and infrastructure for biofuels and establishing a commercial-scale biofuels research facility in conjunction with a state-of-the-art production and distribution complex would elevate LSU a level above other university-based biofuel efforts. Louisiana is situated to become the leader not only in biofuels research but in the integration of biofuels into the nation's energy main stream.

Biofuels may be both an opportunity for the state to become a research, development and operational center for a new industry, and a strategy to return existing facilities that high oil and gas prices have closed down to economic viability.

Policy Analysis Division

Allan Pulsipher, Director

Rigs to Reefs: Louisiana Compared to Texas

The Louisiana and Texas artificial reef programs in which obsolete oil and gas structures are donated to public agencies for use as artificial reefs in lieu of being taken to shore for scrap are the largest "rigs-to-reefs" programs in the world.

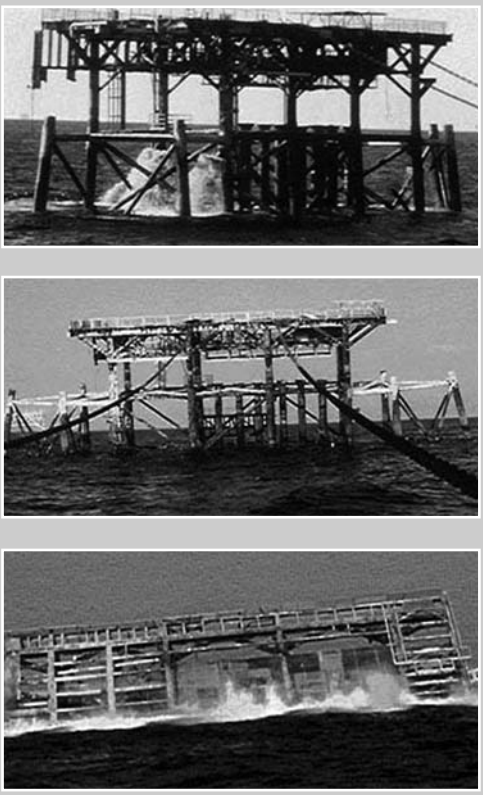
Both deal primarily with the approximately 4,000 structures in the federally regulated Outer Continental Shelf (OCS) of the Gulf of Mexico (GOM) used to produce oil and natural gas. When the economic return from operating structures on a lease falls below the cost of doing so, the operator will terminate production. Once production stops on all structures on a lease, the operator has one year to remove them.

Since 1947, when offshore production in the GOM first began, over 2,200 structures have been removed from federal waters, and over the past decade, about 125 structures on average have been removed annually. Once an offshore structure is removed, however, the artificial reef habitat it created is eliminated and the associated biological community (and any fishermen who patronized it) is seriously affected.

Shortly after an offshore structure is installed, barnacles, oysters, mussels, hydroids, sponges, and corals attach to the underwater frame, which attracts mobile invertebrates and fish species, which in turn attract larger fish that feed upon them, and so on, forming a complex and interrelated food chain. The desire to preserve the diverse ecosystems created by offshore structures became evident in the early 1980s, and with widespread support from the general public, Congress passed the National Fishing Enhancement Act (NFEA).

In June 1986, Louisiana became the first Gulf state to create an artificial reef program under the guidance of NFEA. And in 1991, the Texas Artificial Reef Plan was created. Operators donate a platform into an artificial reef plan when doing so lowers the cost of decommissioning below the cost of bringing the platform to shore for disposal. (Some decommissioned structures are towed to shore and stored for reuse but most are sold as scrap metal). The usual practice is for the state and operator to then split the savings realized from reefing. The state's share goes into the state's trust fund for administration and related activities such as construction of near-shore artificial reefs, buoy maintenance, research, etc.

Thus artificial reef programs often are described as "win-win" operations-habitat and fishing opportunities are preserved, the cost of decommissioning for oil and gas companies is reduced, and the state receives donations to pay for future program operation.



Photos: Louisiana Department of Wildlife and Fisheries.

CES has undertaken several economic and engineering studies of the offshore structure decommissioning and disposal process and published a number of articles on the subject—probably more than any other university-based research unit over the past decade. Drawing on this experience a recent article provided some comparative data that can be used to compare the effectiveness of the Louisiana and Texas programs.[1]

Comparing the Louisiana and Texas programs is of interest since the two programs are both widely regarded as models for other jurisdictions and each program employs a different approach to

Footnote: 1 Kaiser, M. J. and A. G. Pulsipher. Rigs-to-reef programs in the Gulf of Mexico. *Ocean Development & International Law* April-June 36, 2005(2):119-134.

creating and locating the artificial reefs in coastal waters.

Louisiana has designated nine geographically specific approved sites for the disposition of artificial reefs. These sites were identified with active participation by numerous user groups and exclusion mapping was used to eliminate navigation fairways, pipeline corridors, military zones, live bottom areas. The use patterns of recreational fisherman, commercial fishermen, sport divers, menhaden and shrimp fisheries were also analyzed to select areas that participants would prefer. Obsolete structures to be reefed have to be towed to these nine sites unless a special exemption is granted.

Texas uses an exclusion approach under which any area is assumed to be an appropriate reef site unless excluded because of more important alternative uses. Forty-acre reef sites are permitted as long as site location and material placement meet the guidelines. Each 40-acre permitted reef site has enough space to cluster at least nine jacket structures. The initial donor at a permitted site is allowed to topple the structure in place if clearance restrictions can be met. Owners of nearby structures are encouraged to participate in the program by transporting their structures to the existing site to increase its complexity and to avoid additional permitting. Structures at locations that don't qualify as reef sites have to be towed to a site that does.

Because towing a structure is a time consuming process requiring specialized equipment, and disposal of a structure in place often does not require the extensive site clearance procedures involved when a structure is removed, one might expect the cost to be lower and the donation to the state higher under the less restrictive Texas program.

Keeping in mind that the decommissioning and disposal of each structure involves many unique factors of location, condition, size, ownership, etc., the available data do not reveal much difference between the two programs in terms of cost-saving as reflected in the donation to the state.

Using "donation per pile" as a measure, to make a rough correction for the fact that large platforms with more piles cost more to decommission, for larger platforms with eight or more piles the donation per pile for structures that had to be towed to an artificial reef site was $18,348 in Louisiana compared to $18,840 in Texas. For structures that did not require towing, i.e., were located within an approved disposal site in Louisiana or were located at a site not ruled out by exclusion criteria in Texas, the donation per pile was $24,369 in Louisiana compared to $28,428 for structures toppled in place and $31,128 for structures that qualified for partial removal in Texas.

However there does seem to be a clear difference between the two programs' success at attracting or "capturing" obsolete platforms as artificial reefs. In both states almost all structures in water shallower than 100 feet are brought to shore for reuse or scrap, but as water depth increases donation to an artificial reef program becomes more attractive. In Texas 65 percent of platforms located in water between 101 and 200 feet deep were "captured" by the artificial reef program as compared to 31 percent in Louisiana. Eighty-two percent of structures located in water deeper than 200 feet in Texas entered the artificial reef program compared with 58 percent in Louisiana.

The value of the habitat preserved via artificial reef programs varies with the user. From the point of view of fish and other marine life, habitat is habitat. But, from the standpoint of the recreational fisherman, like everything else, relative scarcity determines value. Since there are many more structures located in the Louisiana offshore than the Texas offshore, and active structures provide as good if not better habitat than artificial reefs, the lower capture rate may not be of much consequence for the current generation of fishermen. Such considerations also may address another criticism of the Louisiana program—that many of the approved artificial reef sites are beyond the travel range of the typical recreational fisherman or diver.

As time passes and more structures in more accessible, shallower waters are removed, the rate of capture and subsequent loss or preservation of habitat may become more important considerations for marine planning and resource management.

To view a list of CES publications, visit **www.enrg.lsu.edu/publications/biblio.htm**

Offshore Oil and Gas and Louisiana's Economic Future

Two recently completed studies for the Minerals Management Service provide some timely context for two important questions about Louisiana's economic future. Specifically,

1) How will the near-record oil and gas prices in national energy markets affect the Louisiana economy? And,

2) Will oil and gas reserves located on the offshore under federal jurisdic-

tion continue to be attractive targets for development by oil and gas companies?

Professor Wumi Iledare was the principal investigator for both studies.

The first study, titled "***Economic Effects of Petroleum Prices and Production in the Gulf of Mexico OCS on the U.S. Gulf Coast Economy,"*** developed and estimated a vector auto-regression (VAR) model to measure the interaction between oil prices, oil and gas production, national interest rates and gross domestic product, and selected indicators of the Gulf Coast economy—personal income, unemployment, and state revenues-to establish the direction, symmetry, causation, duration, responsiveness, and correlation between oil and gas industry activity and state economic activity.

The study shows that while the national economy may have become less sensitive to oil prices in the aggregate, the Gulf Coast economies are still vulnerable, albeit with variations across the states. Somewhat surprisingly, the direct effects of oil price changes on personal income, unemployment, and revenues appear to be stronger than the derivative effects, i.e., the effects of the response to the price change itself as opposed to the response to adjustments in production of oil and gas that followed the price change. Most measures indicated a greater response and longer adjustment time to price changes for Louisiana than for Texas, Alabama, or Mississippi, although considerable variation among measures and states is evident. Thus it is questionable at best to assume that measures of national responses are applicable or appropriate across all regions of the country. Understanding the dynamics of oil prices and their impacts on macroeconomic aggregates in the regions/states are important, and in Louisiana's case, the implication is that the near-record-high prices now in effect will have more impact on Louisiana's economy than they will in most other states.

The second study, "***Competition and Performance in Oil and Gas Lease Sales and Development in the U.S. Gulf of Mexico OCS Region, 1983-1999,"*** characterizes the profitability of participating in the exploration and development of offshore leases from several perspectives. Using discounted cash flow analysis to estimate the return from investing in offshore leases in the Gulf of Mexico, the study calculated that the rate of return for all leases was about seven percent and the rate of return from leases on which production actually took place was about 13 percent. During the same time period the rate of return in the U.S. manufacturing sector averaged about 17 percent-providing some useful historical context for current concern about the level of oil and gas company profits. Within the oil and gas sector the very large, international, integrated companies made the highest yielding investments, earning nearly 18 percent compared to only about 5.4 percent for the firms not included in the largest 20 firms in the industry. Despite not doing as well as the very large firms; however, firms not ranked in the top 20 in 1983 controlled about 40 percent of leases in force in 2003. Leases in deeper water yielded much higher rates of return than those in shallow water—an average of nearly 35 percent for producing leases in greater than 900 meters of water compared to only 3.1 percent for leases in water shallower than 60 meters. Both studies are in the final stages of the MMS publication and review process and should be available soon.

Hurricane Analysis

Over the past six years, CES has been heavily engaged in the analysis of energy infrastructure in the state. CES has prepared customized datasets and information on the subject, putting us in a unique position to provide considerable support and analyses in the wake of each storm's passing.

CES was a widely sought-after source of information during the trying period after the storms, and we worked closely with a wide range of stakeholder groups, including the media, state and federal government agencies, industry, trade associations, regulators and civic groups. Over the past year, activity on the CES Internet homepage increased by more than 3,000 hits on our hurricane-related analyses alone.

During the course of both storms, CES was engaged heavily with the media in terms of disseminating information about the extent of the storms' damage and the implication it had for the regional economy and national energy markets. Our insights and analyses were quoted in media outlets including ***The Wall Street Journal***, ***The Kansas City Star***, ***Houston Chronicle***, ***MSNBC*** and ***BusinessWeek.***

CES also gave presentations to a wide range of policy makers, industry executives, and industry groups on the impact of the storms, including the Energy Council, the National Association of Regulatory Utility Commissioners, the Interstate Natural Gas Association of America, and the Southern States Energy Board. CES also provided an important briefing to the U.S. Secretary of Commerce and a delegation of more than 30 national and international business leaders and executives who were in Louisiana during the Gulf Coast Business Investment Mission.

While the storms have passed, CES's work on this subject continues. CES recently received funding to continue longer-run examination of infrastructure development in the aftermath of last year's tropical activity. The research, a two-year project funded by the Minerals Management Service, will examine ongoing infrastructure development in the region and provide ongoing analyses of the relationship between tropical activity and future infrastructure development levels.

Research & Development Division

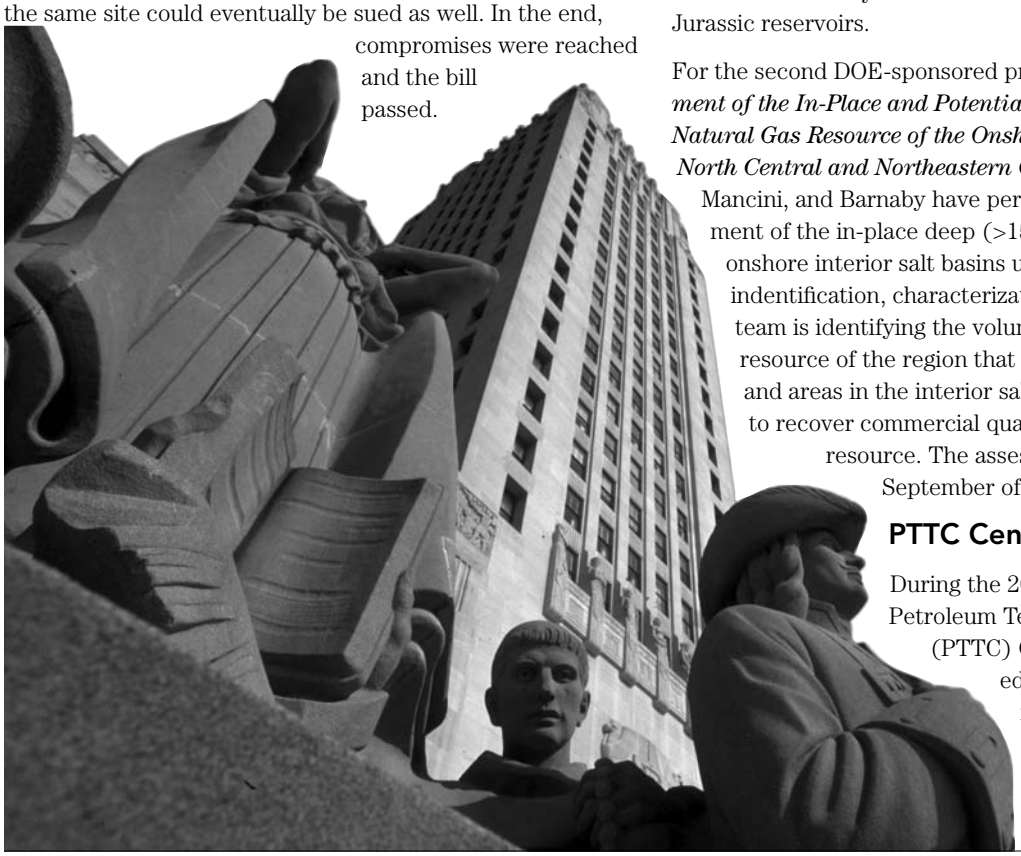
Robert H. Baumann, Director

2006 Legislative Requests

During the 2006 Regular Session of the Louisiana Legislature, the Research and Development Division of the LSU Center for Energy Studies received more than 40 legislative requests for information that either led to proposed legislation or were in response to proposed legislation.

Three bills were filed on ethanol and biodiesel usage, with SB442 by Sen. Ellington and HB685 by Rep. Thompson both passing. Controversial HB685 mandated the use of ethanol and biodiesel in the state once certain production levels were reached. The Center provided actual spot and some contract prices. SB442 was amended such that ethanol usage is not mandated unless the price is competitive with gasoline.

A second controversial bill was SB655 by Sen. Adley, which dealt with remediation of oil and gas sites. A significant component of Governor Blanco's legislative package, the bill dealt with "legacy sites," which are old fields with environmental damage. In some cases, courts have made awards, including monies to correct environmental damage, but the owners of the property never arranged for clean-up. The fear from the business perspective is that a new oil and gas operator using the same site could eventually be sued as well. In the end, compromises were reached and the bill passed.



Other legislative inquiries to which CES responded dealt with estimation of motor fuel taxes at the parish level, the leasing of state property for wind farms, and pipeline property evaluations.

DOE Projects Examine Salt Basin, Deep Gas

CES's Research and Development Division, in conjunction with the Louisiana Geological Survey and the University of Alabama, is involved in two Department of Energy projects. CES associate professor Don Goddard, Ron Zimmermann and Roger Barnaby of LGS, and Alabama's Ernest Mancini have completed Phase I (three years) of "***Basin Analysis and Petroleum System Characterization and Modeling, Interior Salt Basins, Central and Eastern Gulf of Mexico.***" The five-year project employs state-of-the-art computing facilities to model and characterize 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. Findings will provide 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 hydrocarbons located in Cretaceous and Jurassic reservoirs.

For the second DOE-sponsored project, "***Resource Assessment of the In-Place and Potentially Recoverable Deep Natural Gas Resource of the Onshore Interior Salt Basins, North Central and Northeastern Gulf of Mexico,***" Goddard, Mancini, and Barnaby have performed resource assessment of the in-place deep (>15,000 ft) natural gas of the onshore interior salt basins using petroleum system indentification, characterization, and modeling. The team is identifying the volume of the in-place deep gas resource of the region that is potentially recoverable and areas in the interior salt basins with high potential to recover commercial quantities of the deep gas resource. The assessment will be completed in September of this year.

PTTC Central Gulf Region

During the 2005-2006 fiscal year, the Petroleum Technology Transfer Council (PTTC) Central Gulf Region presented six workshops to independent oil and natural gas producers in the region. Total attendance

was 148 for the year. Topics included a work production performance toolbox for independents; reservoir engineering tools; horizontal well technologies and coalbed methane applications (with the Texas region PTTC); a Strategic Online Natural Resources Information System (SONRIS) workshop; and an update of stimulation of watered-out inactive or marginal wells with dual completions. Workshops also covered gravity stable enhanced oil recovery and mature well performance prediction for independents. The annual

reservoir engineering symposium will be December 7 in Lafayette. In addition to workshops, the PTTC Central Gulf Region responds directly to numerous requests from operators for upstream technical information via telephone, email, and post.

R&D Efforts Support Local, International Energy Interests

In the past year, the Research & Development Division completed review of some 70 proposals submitted for funding as a part of the African Energy Program. Funding, which is directed to individual African nations, is provided largely by European nations.

R&D also continues to serve as the coordinating unit for the Clean Power and Energy Research Consortium (CPERC). The consortium consists of five universities: LSU, University of New Orleans, Nicholls State University, Southern University, and Tulane University. CPERC supports ongoing research activities in Louisiana in the area of power generation and emissions control and leads the nation in the development of new technologies for the power generation industry with specific emphasis on clean power generation. Its goals include lowering energy costs, reducing emissions, and improving reliability. Seed funding of some $460,000 per annum is provided by the Board of Regents.

Baumann Honored with LIOGA Lifetime Achievement Award

Robert H. Baumann, CES director of research and development, was honored for lifetime achievement by the Louisiana Independent Oil & Gas Association (LIOGA) at its annual meeting March 6 in Lake Charles. LIOGA president Don G. Briggs presented the award to Baumann for having "unselfishly given of his time and energy to bettering the working environment of Louisiana's oil and gas industry." Baumann is one of only three individuals to have received the award since the LIOGA was organized in 1992. Oilmen Henry Goodrich of Shreveport and Paul Hilliard of Lafayette previously received the award.


Robert H. Baumann

Baumann began his career working on environmental issues at LSU's Center for Wetland Resources and has been with the Center for Energy Studies since its formation in 1982. He serves as director of the Central Gulf Region of the Petroleum Technology Transfer Council and as Louisiana's university representative to the Center for Legislative Energy and Environmental Research (CLEER), which assists member states in developing sound legislative energy and environmental policies. He has authored more than 50 articles on energy and environmental topics and has served as technical advisor to the Governor's Energy Commission under Governors Foster, Edwards, and Roemer.

Data & Information Services Division

Barbara Kavanaugh, Head Librarian

The Data and Information Services Division, in addition to supporting the Center's research staff, responds to energy information requests from state agencies, the legislature, and business and industry. Sources include the Department of Environmental Quality, Department of Labor, Department of Natural Resources, Department of Revenue, the U.S. Department of Energy, Energy Information Administration, and the Minerals Management Service.

During the past year, staff began compiling information for an energy resource guide for the Louisiana Department of Economic Development that will identify Louisiana's educational institutions, commercial service and training centers, government agencies, and industry associations that specialize in oil, gas, and refining operations. The guide will be published later this fall.

Constantly changing oil and gas prices were updated daily in the division's database of nearly 500 variables, which includes monthly, quarterly, and annual statistics on Louisiana reserves; drilling and production; refining and refined products; electricity generation, cost, and consumption; and energy employment, wages, taxes, and revenue.

Computer analysts for the division completed a pilot project with the release of the last of a three-part series of CDs titled *Louisiana Parish Well Reference*, a Geographic Information System (GIS) for the Louisiana oil and gas industry containing historical field and lease unit well production at the parish level for St. Bernard, Cameron, Rapides, and Vernon Parishes.

CES Funded Projects

"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. Project funding: $1,359,053. (Five Years).

"Resource Assessment of the In-Place and Potentially Recoverable Deep Natural Gas Resource of the Onshore Interior Salt Basins, North Central and Northeastern 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. Project funding: $979,818. (Three Years).

"A Comprehensive History of the Offshore Oil and Gas Industry in Louisiana and its Consequences." Allan Pulsipher. Funded by the U.S. Department of the Interior, Minerals Management Service. Project funding: $900,000. (Three Years).

"Post Hurricane Assessment of OCS-Related Infrastructure and Communities in the Gulf of Mexico Region." David Dismukes, Allan Pulsipher, Kristi Darby, and Seth Cureington. Funded by the U.S. Department of the Interior, Minerals Management Service and the LSU Coastal Marine Institute. Project Funding: $224,837.

"A Collaborative Investigation of Baseline and Scenario Information for Environmental Impact Statements." David E. Dismukes, Dmitry V. Mesyanzhinov, and Williams O. Olatubi. Funded by the U.S. Department of the Interior, Minerals Management Service. Project Funding: $600,000. (Three Years).

"Capital Investment Decision Making and Trends: Implications on Petroleum Resource Development in the U.S. Gulf of Mexico." Mark Kaiser, Allan Pulsipher, and Omowumi O. Iledare. Funded by the U.S. Department of the Interior, Minerals Management Service, and the LSU Coastal Marine Institute. Project funding: $123,244.

"Idle Iron, Scrap, and Reuse in the Gulf of Mexico: Issues, Perspectives, and Policy." Mark Kaiser, David Dismukes, and Allan Pulsipher. Funded by the U.S. Department of the Interior, Minerals Management Service, and the LSU Coastal Marine Institute. $129,745.

"Accounting for Economic Change in the Gulf of Mexico: Developing a Comparative Context for Analysis of Cumulative Socioeconomic Effects on Coastal Communities." Allan Pulsipher, Wumi Iledare, and David Dismukes. Funded by the U.S. Department of the Interior, Minerals Management Service, and the LSU Coastal Marine Institute. Project Funding: $139,527.

"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. Project Funding: $264,332.

"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. Project Funding: $185,527.

"Examination of Opportunities for Drilling Incentives on State Leases." David Dismukes, Bob Baumann, and Kristi Darby. Funded by the Louisiana Department of Natural Resources. Project Funding: $74,991.

"Examination of the Economic Development Opportunities of Liquefied Natural Gas Facilities in Louisiana." David Dismukes. Funded by the Louisiana Department of Economic Development and Greater New Orleans, Inc. Project Funding: $17,117.

"Examination of the Development of Liquefied Natural Gas Facilities in the Gulf of Mexico." David Dismukes, Kristi Darby, and Seth Cureington. Funded by the U.S. Department of the Interior, Minerals Management Service, and the LSU Coastal Marine Institute. Project Funding: $66,385.

"Ultra Deepwater Road Mapping Process." David Dismukes and Kristi Darby. Funded by the State of Texas-Subcontract with Texas A&M. Project Funding: $15,000.

"An Intra-University Workshop on Characterizing Cumulative Socioeconomic Effects of Offshore Oil and Gas Development." Allan Pulsipher, Craig Colten (Department of Geography), William Bankston (Department of Sociology), and Joachim Singelmann (Department of Sociology). Funded by the U.S. Department of the Interior, Minerals Management Service, and the LSU Coastal Marine Institute. Project Funding: $95,507.

Conference Center Update

In February, the auditorium in the Energy, Coast & Environment Building rotunda was named for LSU alumnus Dalton J. Woods. The Woods family has provided a generous endowment that will help fulfill the original mission of the facility to provide a forum for energy research and education.

During FY 2005-2006, the Woods Auditorium, rotunda lobby, and conference room were venues for 270 events. In-house use accounted for 64 percent of the meetings held in the center; LSU unit events represented 30 percent; and non-LSU organizations scheduled 6 percent of the events held.

The conference center, as well as CES's office space, has wireless Internet access thanks to PTTC and self-generated revenue. Visitors can use wireless devices such as personal data assistants (PDAs) and laptop computers.

Robert H. Baumann speaks at the Dalton Woods dedication.

The Louisiana Applied and Educational Oil Spill Research and Development Program

www.osradp.lsu.edu
Don Davis, Coordinator

The OSRADP has an annual research budget of $530,000 and underwrites 10 to 15 projects annually. The process begins with the acceptance of preproposals in October. These submissions must be "blind"—no names of academic institutions and/or scientists. Once the Proposal Review Board has reviewed and ranked the preproposals, the principal investigators associated with projects that have been elevated to full proposal status are notified to write a full proposal according to the guidelines posted on our Web site. Full proposals are due in January. These are reviewed and ranked, and the scientists with projects considered for funding are invited to present a short summary of their work to the full Board in late March or early April. Awards are made in May, with deliverables due 30 June the following year.

Although in some geographic regions interest in oil spill research may be waning, this is not the case in Louisiana. In fact, the program is getting stronger. Because oil and/or gas are produced in all 64 Louisiana parishes, the program has underwritten upland, as well as marine-oriented, research endeavors. Consequently, since the fall of 1993, the OSRADP has granted 140 subcontracts/letter agreements in support of 97 projects—43 were funded for two years; $42,466 is the average award. A generic summary of these projects includes: in-situ burning; phytoremediation; remediation and restoration in wetlands and uplands; pipeline analysis and mapping; oil spill risk on the Mississippi River; oceanic and atmospheric conditions off the Mississippi delta; various GIS and aerial video surveys and/or databases; wave-current online information system; estuarine trajectory analysis; and education-related material.

The Louisiana Applied and Educational Oil Spill Research and Development Program (OSRADP) provides tools that will assist the oil spill response community in cleaning up spill sites in an environmentally sound manner, using the best tools available that are practical and cost effective. For more than a decade, the OSRADP has provided the oil and gas industry with a vast assortment of tools and techniques related to spill response, cleanup, and public outreach.

All of these efforts 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. Synopses of these research topics can be reviewed on the Internet at **www.osradp.lsu.edu.** The program's success is due, in part, to the long-term availability of dedicated research funds. The OSRADP allocates these funds to the state's university-based scientists, with the goal of encouraging applied research of the highest quality. The OSRADP's current challenge is to move completed research off the shelf and into the field. Partnerships with the appropriate regulatory agencies are an essential component of this transition, and we invite all interested parties to review and use our work.

Hurricane Response

As a result of hurricanes Katrina and Rita, the state's oil spill coordinator received more than 400 incident reports. Eleven major spills (defined as spills involving at least 100,000 gallons) were managed simultaneously for several months after these events. In total, more than 8 million gallons of oil was discharged in Louisiana's coastal zone, compared to the approximately 11 million gallons that were discharged in Alaska's Prince William Sound from the Exxon Valdez.

From Louisiana's perspective, the good news was the oil did not accumulate in any one spot. Under highly adverse conditions, the spilled product was cleaned up in an efficient manner. The bad news was that a large spill occurred when a storage tank at the Murphy Refinery in

Chalmette was dislocated from its foundation, affecting at least 1,700 homes in an adjacent residential neighborhood; an area of about one square mile. Apparently, the storms did a good job of dispersing and mixing the discharge product into the water column. Using a number of products associated with the OSRADP, managing and responding to these events was made easier.

Funded Projects

The program's research initiatives are divided into four categories: spill of opportunity; education, training and public awareness; remote sensing and mapping; and spill response cleanup and harmful ecological consequences. Each project's scientific merit is based on the simple question: Can the results be implemented in a spill event? To be a practical field tool, many of these projects need approval from the regulatory community.

Spill-of-Opportunity

Spill-of-opportunity funds are used to apply and evaluate new and/or experimental technology to enhance the recovery of spilled oil or to test experimental cleanup techniques in a field situation. The program is not interested in monitoring, although some monitoring may be necessary to prove results. The OSRADP, therefore, has supported projects that can benefit from a field event. Six projects have used these funds.

Education, Training and Public Awareness

Education, training, and public awareness have evolved into important components in the OSRADP's mission. Public perception often far exceeds reality. Originally, the program focused on educating middle and senior high school students about earth sciences and the oil and gas industry through the *Oil Spill Awareness through Geoscience Education (OSAGE)* CD-ROM and *Oil Spill Awareness through Geoscience Education (OSAGE): An Overview of its Development, Implementation, and Impact.* The CD evolved from an original project that focused on concepts, activities, and resources into a multimedia-oriented educational tool. Nearly 10,000 copies of the CD have been systematically distributed to appropriate science educators throughout the state and a group of teachers is currently teaching other teachers how to incorporate this material into their classrooms and at the same time expose students to computer-driven geographic information systems.

Remote Sensing and Mapping

Oil and/or gas are produced in every parish in Louisiana involving at least 230,000 wells (approximately 30,000 are in production). Each well, along with its ancillary support services, represents a potential spill site. Through seminars and other meetings with oil industry officials, it was clear the industry needed an up-to-date map. To fill this void, the oil

spill coordinator contracted research scientists at LSU to produce the *Louisiana Oil Spill Contingency Plan Map*. To improve the map's distribution, it is available on a CD-ROM with appropriate GIS overlays on the Internet.

Rapid response to oil spills is critical for effective clean up and remediation, especially for spills on water or in wetlands. To assist with this challenge, two groups have surveyed and described waterway access points throughout south Louisiana's lower tier of parishes: *"Boat ramp and launch site inventory, southwest Louisiana coast zone" and "Oil and hazardous spill access point inventory for southeast Louisiana."* These data are now part of the state's GIS. As a result of this work, the oil and gas industry, the state's trustees, and clean-up organizations have available a complete inventory of the coastal zone's boat launch facilities.

All land/water interface boundaries are important to spill planners, as they change quickly in coastal Louisiana. *"Digital access to aerial videotape survey data"* is a project whose mission was to digitize and index a vast amount of analog video to create a system for efficient accessing of aerial videotape survey information on a CD-ROM or through a Web site. This project, along with one that documents all industries on the Mississippi River, was widely used in the aftermath of Hurricanes Katrina and Rita.

For more than 100 years, Louisiana has been involved in oil and gas exploration and development; as a result, the state's oil and gas pipeline network is highly complex and routes are often not well documented. Recognizing this complication as a potential clean up problem, several pipeline mapping projects have been funded by the OSRADP. The objective of this effort in north and south Louisiana is to establish the location of all petrochemical pipelines of at least four inches in diameter. The construction of accurate digital pipeline maps is essential to environmental monitoring, proper energy planning, disaster prevention, and emergency preparedness and response. These projects are designed to produce a seamless, accurate, statewide pipeline map using field crews, equipped with global positioning system (GPS) equipment and digital compilation of the field data in a geographic information system (GIS).

Although theoretically not a mapping project, the *"Wave-current online information system for oil spill contingency planning"* is a project partially funded by the OSRADP. This online oceanographic and meteorological observing system is designed to support Louisiana's ability to anticipate and prepare for emergencies offshore (oil spills, hurricanes, winter storms, shipping accidents, etc.), and assist numerical modeling efforts during storm events by measuring important data sets and making them available in real time, or, after arching, as a time series. WAVCIS (Wave Current Information System) provides water information including wave height, period, direction of propagation, water level, surge, water column velocity profiles, and meteorological conditions on a near real time basis. The system was extremely valuable during the 2004 and 2005 hurricane season.

Spill Response, Cleanup and Harmful Ecological Consequences

At best, responding to a wetland spill is difficult. The cleanup activity often does more damage than the actual spill. Consequently, a series of studies involving in-situ burning has been initiated. These studies include

- *"Environmental effects and effectiveness of in-situ burning in wetlands: considerations for oil spill cleanup";*
- *"Evaluation of habitat responses to in-situ burning as a method of oil removal phase II-sagittaria lancifolia salt marsh field study";*
- *"Evaluation of habitat response to in-situ burning as a method of oil removal phase III-sagittaria lancifolia fresh marsh field study";*
- *"In-situ burning studies for onshore oil spills"; and*
- *"Salt marsh recovery after in-situ burning for oil remediation: effects of water depth and burn duration."*

After extensive laboratory and field trials, the scientists agree the best method to clean up a wetland spill, provided there is a thin layer of water on the marsh surface and with the agreement of all trustees and interested parties, is to burn off the residual oil. This is a cost-effective technique that, under the right conditions, does little damage to the plants. Since fire culture has been a part of wetland inhabitants annual use cycle for more than 100 years, burning the marsh is not a new or novel practice.

In addition to this work, a group of plant scientists are investigating how plants help naturally remediate highly disturbed sites. Because plants improve soil chemistry and structure and contribute to ecosystem function, the research team has focused their research on re-establishing vegetation on oil and oil brine spill sites and accelerating restoration.

Louisiana Geological Survey

www.lgs.lsu.edu
Chacko J. John, Director and State Geologist

LGS Assists in Hurricane Response

Cited by the Louisiana Department of Wildlife and Fisheries (LDWF) for their efforts and for "helping to save numerous lives," the Louisiana Geological Survey (LGS) staff participated in preparations, emergency response, and recovery efforts for Hurricane Katrina. LGS assistant director John E. Johnston III, the department's regular representative to the Louisiana Office of Emergency Preparedness, carried out scientific and liaison work with the LDWF, the U.S. Coast Guard, and other agencies, and along with LGS computer analyst Reed Bourgeois, provided scientific input, printing and plotting support, and computer hardware and software for creating maps used by emergency responders for search and rescue and other emergency operations. LGS cartographers Hampton Peele, John Snead, and Robert Paulsell worked in association with other LSU components and the U.S. Geological Survey to provide important mapping support for state and federal agencies.

Assistant professor Thomas van Biersel and accounting specialist Jeanne Johnson prepared a 911 phone call registry and also did mapping and database work in cooperation with the U.S. Geological Survey's National Wetland Research Center personnel in support of the LDWF's search and rescue operations. They prepared an emergency call database that was used to compile search and rescue maps of the location and time of emergency calls made in the New Orleans area during and after Hurricane Katrina. These maps, multiple copies of which were printed by the LGS and the USGS and supplied to the agencies involved in search and rescue efforts, aided rescue teams in locating people trapped by the storm and saved lives. Van Biersel, Bourgeois, Johnson, and Peele were all commended by the LDWF for their efforts.

Established in 1934 by Act 131 of the Louisiana Legislature, the Louisiana Geological Survey provides unbiased geological and environmental information to state agencies and other decision-making bodies to assure environmentally sound natural resource development and economic prosperity for the state.

LGS staff providing various forms of assistance during and after Hurricane Katrina included director Chacko John, research associates Brian Harder and Byron Miller, and office coordinator Ann Tircuit.

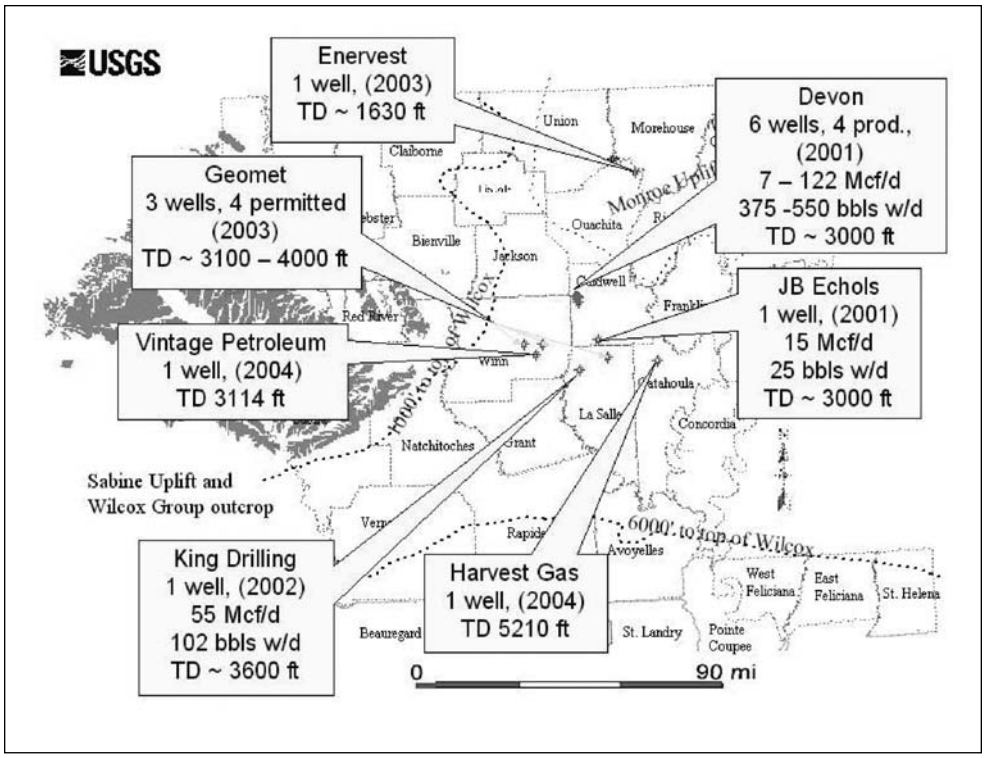
Subsequent to Hurricane Katrina, LGS assistant professors Thomas van Biersel, Douglas Carlson, and research associate Riley Milner took part in a joint study with the USGS and the Louisiana Department of Environmental Quality to determine the effects of Hurricane Katrina's storm surge on water wells on the north shore of Lake Pontchartrain. Ongoing efforts are underway to see if the flood resulting from the hurricane may have driven saline water down existing water wells or directly invaded shallow aquifers in the vicinity of Lake Pontchartrain.

Basin Research Energy Section

The Basin Research Energy Section of the LGS is the oil, gas, and coal research section of the LGS. This section performs research into the nature and occurrence of oil, gas, and coal primarily in Louisiana and the Gulf Coast. This section was formerly the LSU Basin Research Institute, which was established in 1984 and which was merged into the Louisiana Geological Survey in 2000.

MMS Project

Research associate Byron Miller is the principal investigator on a project funded by the U.S. Department of the Interior Minerals Management Service (MMS) to determine if offshore oil and gas production could be contributing to Louisiana's coastal land loss problem. A draft report has been submitted to MMS for review.



CBM drilling activity in north Louisiana. (from Breland and Warwick, 2004)

Louisiana's coastal land loss is a problem of great concern and most likely the result of natural processes and human activities. However, the extent to which man's activities have impacted the subsidence of coastal wetlands remains a key point of debate. Oil and gas extraction has been cited as a possible contributor to land subsidence, resulting in coastal land loss.

This project analyzed well test and production data for key producing fields located onshore in Plaquemines Parish, and in the offshore West Delta area. The fields studied lie along a linear trend spanning offshore and onshore environments and have been prolific hydrocarbon producers for many decades. In addition, this area of Plaquemines Parish experiences high subsidence rates and large areas of land loss.

Project results show periods of high oil and gas production coincide with periods of high land subsidence rates and periods of significant land loss. Reservoir pressure data provides no indication of offshore production affecting onshore reservoirs or land subsidence. Although hydrocarbon production may be one factor contributing to land subsidence and land loss, production rates have declined over the past few decades, suggesting the contribution to future land subsidence rates should be minimal.

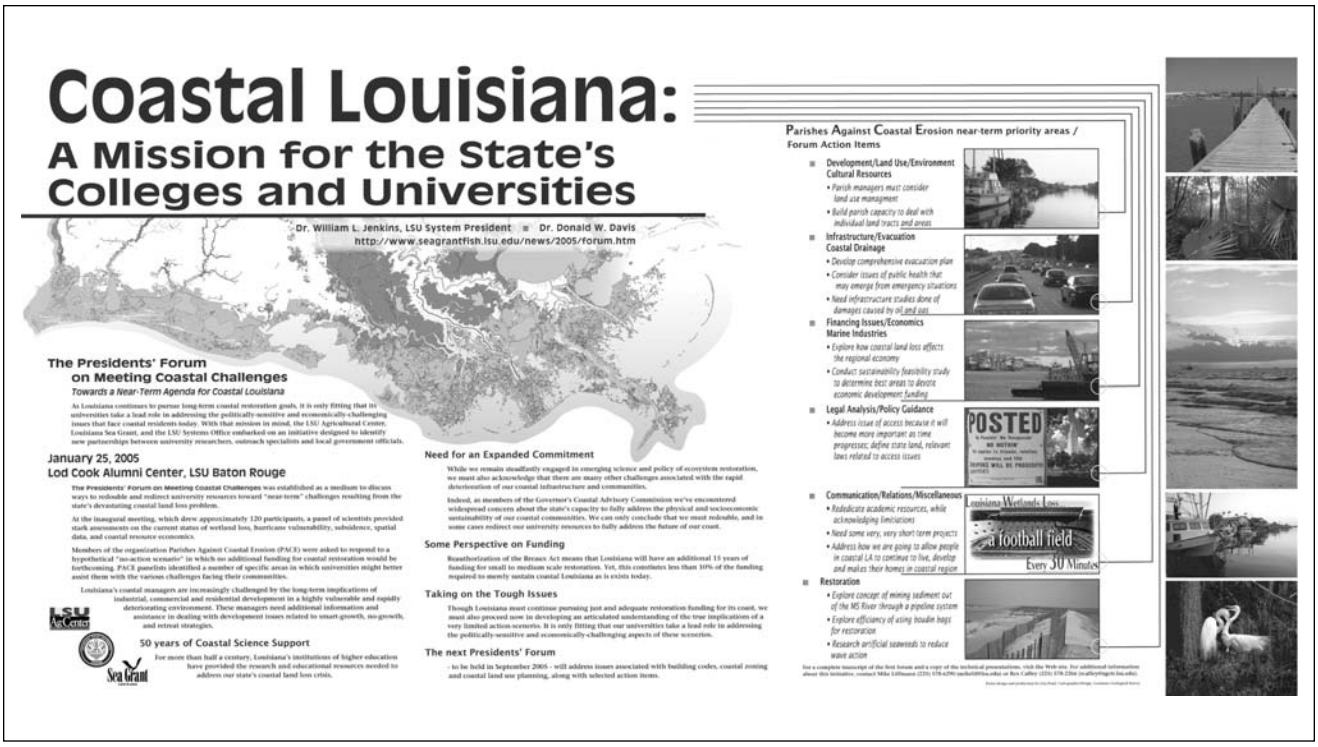
Coalbed Methane Potential

In the face of declining domestic reserves of oil and gas, the gap between domestic energy consumption and energy production will have to be filled with imported oil and gas and unconventional sources like coalbed methane (CBM). CBM represents eight percent of total domestic natural gas production, an amazing number in light of the fact that CBM has only been recognized as an energy resource since the late 1970s.

CBM production has been established in a number of coal basins domestically and has only recently begun to be developed in the Gulf Coast and Louisiana in particular. The Louisiana CBM resource is located in the northern part of our state and has the potential to be of significant economic benefit to that region and the state. The development of the CBM play is in its infancy in Louisiana. Less than two dozen CBM wells have been drilled. One only needs to look at the Powder River Basin CBM production (an area smaller than north Louisiana) in the past ten years to recognize how significant an economic impact the development of the CBM resource could have upon the state. The Powder River Basin has seen more than 15,000 wells drilled in the last ten years, with another 30 to 40 thousand projected in the next decade.

Field Studies Series Continues with Chandeleur Sound Area

Chacko John, Bobby Jones, Brian Harder, and Reed Bourgeois have just completed the next installation in the series ***The Atlas of Oil and Gas Fields in Offshore State Waters of Louisiana*** with the Chandeleur Sound area, located east of New Orleans in St. Bernard Parish. The area covers the scattered near shore waterbottoms on the west, the state of Mississippi waters on the north, the federal waters to the east, and the Breton Sound and Main Pass areas on the South. Thirty-one oil and gas fields were examined in the state waters of Chandeleur Sound. The first field discovered by Phillips Petroleum Company was Eloi Bay Field on December 28, 1953. As of January 1, 2005 there were 775 wells permit-



LGS Cartography designed technical posters for OSRADP, The LSU Hurricane Center, Louisiana Tech, the Coalition to Restore Coastal Louisiana, and LSU President Jenkins.

ted in these fields, with 519 successfully completed. Total production from 1954 through 2004 was 265, 612,566 MCF of gas, 538,886 barrels of condensate, 107,957,718 barrels of oil and 56,383,664 MCF of casinghead gas produced. The number of producing sands range from a single sand in eighteen fields to as many as thirty-two in the Eloi Bay Field. The presence of well-developed and low-resistive sands and the number of stratigraphic traps in the Chandeleur Sound Area suggests that potential traps and accumulation of hydrocarbons may still exist in the area. Renewed exploration in the area has proven this to be true by the discovery of nine new fields since April 1994. The series, which began with Breton Sound, will continue with the Main Pass area.

LGS Cartographic Section

The Louisiana Geological Survey cartographic section specializes in the compilation, design, and production of maps, geographic information systems, and technical publications. Most cartographic projects are conducted under contract to address specific mapping requirements of client agencies, but also for LSU departments and LGS publications.

Hurricane Response

During the aftermath crises of Hurricanes Katrina and Rita, the staff of five experienced cartographers and GIS scientists, with support from three graduate assistants, were heavily involved in the map and geographic information system (GIS) support of emergency response agencies. LGS cartographic section labs on campus were manned and operated nights and weekends for several weeks during the crisis, supporting FEMA and other state and federal agencies with maps, imagery, and data sets. LGS staff worked at the Louisiana Emergency Operations Center providing on-site GIS support, and research associate Hampton Peele developed a 911-grid, search-and-rescue GIS for the state Department of Wildlife and Fisheries during the Hurricane Rita response.

Major cartographic section projects are funded by sponsored research contracts from state and federal agencies that require the development of maps, publications, spatial data, and GIS products. Current contracts are listed below:

"Mapping Support for Assessment and Remediation of Public Health Impacts of Hurricanes and Major Flooding Events: New Orleans Area." John Snead is principal investigator of a five-year project sponsored by the LSU Center for the Health Impacts of Hurricanes under funding from the Board of Regents. Hampton Peele is the GIS coordinator of the project also involving Robert Paulsell, Asheka Rahman, with Ahmet Binselam (Hurricane Center), and Dewitt Braud (Coastal Studies Institute).

"Research and Development of a GIS of Petrochemical Pipelines between Baton Rouge and New Orleans, Louisiana." Robert Paulsell is principal investigator of a

three-year project from the Louisiana Applied and Educational Oil Spill Research and Development Program, with Asheka Rahman and Patrick O'Neal.

"Mapping and Technical Support for the Louisiana Oil Spill GIS." Hampton Peele is principal investigator and is involved with developing data for the Louisiana GIS-CD series, sponsored by the Louisiana Oil Spill Coordinator's Office.

"Field Investigation and Digital Mapping of the Pipeline Crossings of the Coastal Zone Navigation Channels in Louisiana." John Snead is principal investigator, with Robert Paulsell and Asheka Rahman. The Louisiana Applied and Educational Oil Spill Research and Development Program sponsored the project.

Lisa Pond is principal investigator of two projects to design and prepare the technical publications **"Habitats of Barataria Terrebonne"** and **"Tidal Graph Calendar 2006"** for the Barataria-Terrebone National Estuary Program.

Hampton Peele is GIS coordinator for two 100K geologic map projects **"Monroe South"** and **"Shreveport North"** sponsored by the U.S. Geological Survey.

Water & Environmental Section

The water and environmental section of the LGS performs research on the hydrologic systems of Louisiana, specifically on how the state's aquifers interact with each other and with the state's rivers, lakes, and wetlands. Water quality and the ways in which natural and man made pollutants are distributed and move within the aquifers, as well as interactions with surface water bodies, are also studied. The results of this research into the state's hydrologic systems allow the LGS to provide effective technical assistance and support to various stakeholders of Louisiana water resources, thus aiding in Louisiana's management of this valuable resource.

Response to Katrina and Rita's Impacts on the Groundwater Quality of Southeastern Louisiana

In September and October 2005, in a joint effort by Douglas Carlson, Riley Milner and Thomas Van Biersel and in collaboration with staff from the Louisiana Department of Environmental Quality and the U.S. Geological Survey, water supply well samples were collected and analyzed for chemical parameters and bacteria. These samples were collected form water wells located between Slidell, Louisiana, and Madisonville, Louisiana, that are within the area affected by Katrina and Rita's storm surge along the north shore of Lake Pontchartrain. The concern was whether storm surge water had invaded the wells. Analysis included the determination of concentrations of organic compounds, metals, common ions, general water parameters, and three types of bacteria. Ten wells appeared to have yielded water samples that showed saline water intrusion.

Thomas Van Biersel collects water sample from well in Katrina surge zone.

Follow-up work supported by a grant from the Louisiana Water Resources Research Institute began this spring and will continue for a year. This study continues the monitoring observations of wells sampled directly after the hurricanes to determine if recovery from the impact of Katrina and Rita has occurred or whether there might be long-term impact. Because the velocity of groundwater is often slow, a few feet per year, it is necessary to check wells for a pulse of saline water that could take months to percolate down through the overlying material into aquifers used by residents and businesses along the north shore of Lake Pontchartrain.

Mississippi River Alluvial, Sparta, and Southern Hills Models are being developed by Douglas Carlson and Thomas Van Biersel. Riley Milner and Douglas Carlson are nearing completion of the geologic characterization and modeling of the Chicot Aquifer System.

Geologic Review Section

Geologic Review was created by the Louisiana Geological Survey in 1982 to provide regulatory technical assistance 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). The program exists to help implement Act 404 (The Clean Water Act) and the Louisiana Coastal Zone Regulations, both of which impact oil and gas operations by mandating that only the least damaging feasible alternative be permitted. Geologic Review determines what the least damaging feasible alternative actually is; since the primary goal of oil and gas operators is to maximize profits, the nature of their proposed operations may reflect that fact and less-damaging feasible alternatives can often be found by reviewing the relevant geologic, engineering, lease, and sometimes economic data involved. An annual reduction in permitted impact footage versus requested footage of greater than 85 percent is not uncommon. The long-term

effect of Geologic Review has been an overall 75 percent reduction in the average length of canals and board roads built in the Louisiana Coastal Zone.

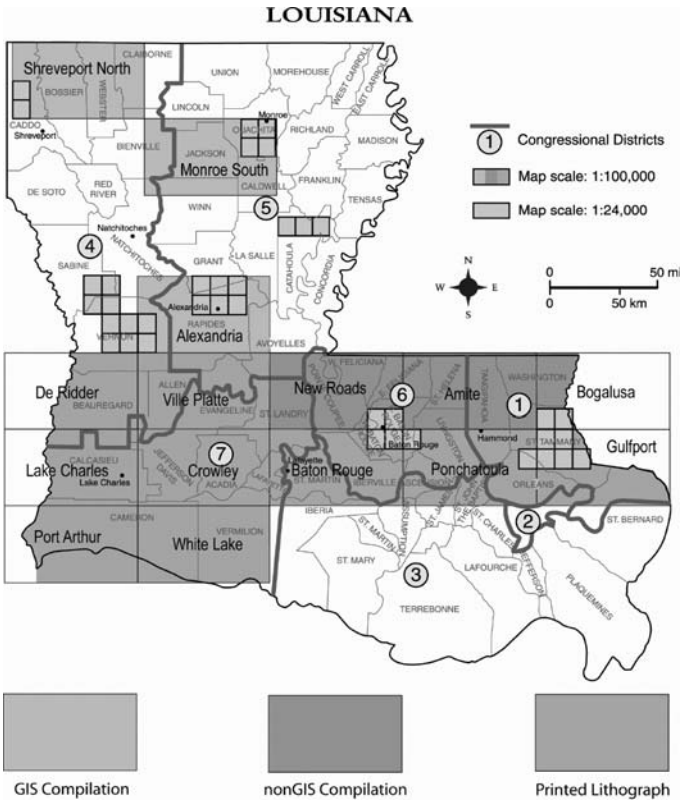
Geologic Mapping and Mineral Resources Section

The Geologic Mapping and Mineral Resources Section conducts investigations of surface geology primarily involved with the creation of geologic maps, which depict the distributions of rock types, strata, and geologic features, such as faults, according to their particular characteristics and geologic ages. Geologic maps are built upon information about the properties—especially composition and texture—of different rock and sediment occurrences, yet as well embody interpretations that result in particular renderings of strata and their boundaries, configurations, and structures.

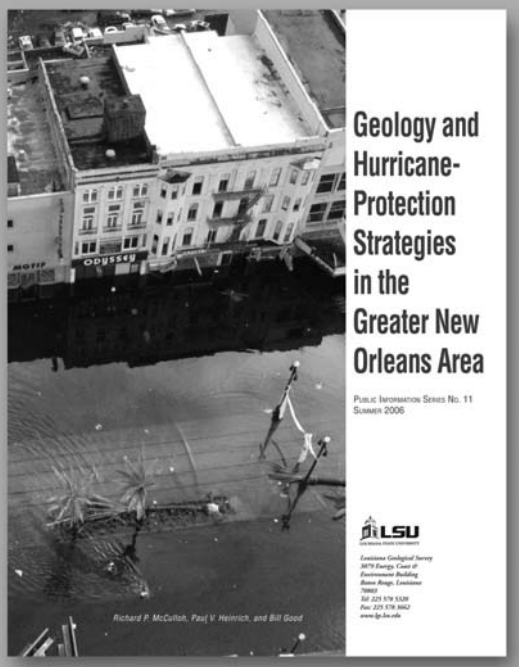
While geologic maps have value in themselves for understanding the geology of areas, they also are potential sources of derivative applications, such as the delineation of areas with engineering properties of interest. Interpreting the geology in coastal-plain settings such as Louisiana presents problems that tend to be subtler and less dramatic than those in many other settings, e.g., in areas of active or geologically recent mountain building or volcanism; still, the mapping of coastal-plain geology presents its own unique problems.

Recent projects include mapping the south Louisiana coastal plain and mapping in portions of north Louisiana. LGS was funded by the U.S. Army Corps of Engineers in the late 1990s to map the geology of ten 7.5-minute quadrangles encompassing the Fort Polk area in west-central Louisiana; and it recently produced two 30 x 60 minute geologic quadrangles, Port Arthur and White Lake, at 1:100,000 scale.

Present geologic mapping work is funded by the U.S. Geological Survey under the National Cooperative Geologic Mapping Program. Richard McCulloh and Paul Heinrich are the principal investigators on the project.



LGS has published eight 1:100,000-scale geologic quadrangles as cartographic products for sale to the public.



The publication *Geology and Hurricane-Protection Strategies in the Greater New Orleans Area* is part of the LGS's Public Information Series.

Outreach and Educational Activities

The LGS Outreach and Educational program has been an integral part of our mission since 1934. The LGS is the state's primary source of educational and technical geological information about Louisiana's natural resources.

Educational materials LGS provides to the citizens and those interested in Louisiana geological history are in the form of brochures, field-trip guides, booklets, maps, post cards, and posters. Many items are available free to the general public and other materials are available to teachers by written request on their school letterhead.

The LGS Public Information Series includes booklets about rocks and minerals, water resources, folios, bulletins, maps, CD ROMs and free pamphlets and fact sheets.

The survey staff historically has answered hundreds of requests for information and assistance, judged science fairs, helped students conduct scientific research, visited K-12 schools, lectured to civic groups, and made presentations to educational and professional conferences.

LGS Resource Center

The LGS Resources Center is located on the LSU campus and consists of a core repository and well log library. The core facility has more than 30,000 feet of core from wells in Louisiana, Alabama, Arkansas, Florida, Mississippi, and Texas. The well log library contains more than 50,000 well logs, most of them from Louisiana. The LGS Resource Center is available for use by industry, academia, government agencies, and those who may be interested. Details of current holdings are posted on the LGS Web site www.lgs.lsu.edu under Publications and Data.

A list of LGS publications is available at **www.lgs.lsu.edu**
Printed copies are available free of charge by calling 225-578-8590.

Minerals Processing Research Institute

www.mpri.lsu.edu
Ralph W. Pike, Director and Paul M. Horton Professor of Chemical Engineering
F. Carl Knopf, Associate Director and Robert D. & Adele Anding Professor of Chemical Engineering

Research

Current research is on new processes for carbon dioxide and carbon nanotubes, sustainable development, energy management (pinch analysis, cogeneration, on-line optimization) and inherently safer design and operations for chemical plants and petroleum refineries. Research and technology transfer involves collaboration with process and plant engineers with Monsanto, Motiva Enterprises (formerly Texaco), Mosaic Inc. (formerly IMC Agrico) and others.

One of the Institute's federally funded projects has demonstrated that greenhouse gas emissions can be minimized by converting carbon dioxide to useful products. Another is conceptual designs of two industrial scale processes to show the feasibility of producing carbon nanotubes in plants that can be integrated into the local chemical production complex in the lower Mississippi River corridor for a new high value-added product for the chemical industry. A third is demonstrating an analytical tool for cogeneration for combined electricity and steam production (CHP) as a means of substantially increasing energy efficiency and reducing greenhouse gas emissions that examines corporate energy use in multiple plants and determines the best energy use based on economics, regulatory emissions, and environmental impacts from greenhouse gas emissions.

Formed in 1979 as one of 31 U.S. Department of Interior State Mineral Institutes, the Minerals Processing Research Institute (MPRI) coordinates research and public service programs in process research and technology transfer; sustainable development; energy management; and inherently safer design for processing of oil, natural gas, salt, sulfur and lignite. Its focus is minerals processing research for chemical plants and petroleum refineries. Currently, MPRI has cooperative agreements in place with IMC Agrico, Monsanto, and Motiva (formerly Star/Texaco).

New Frontiers

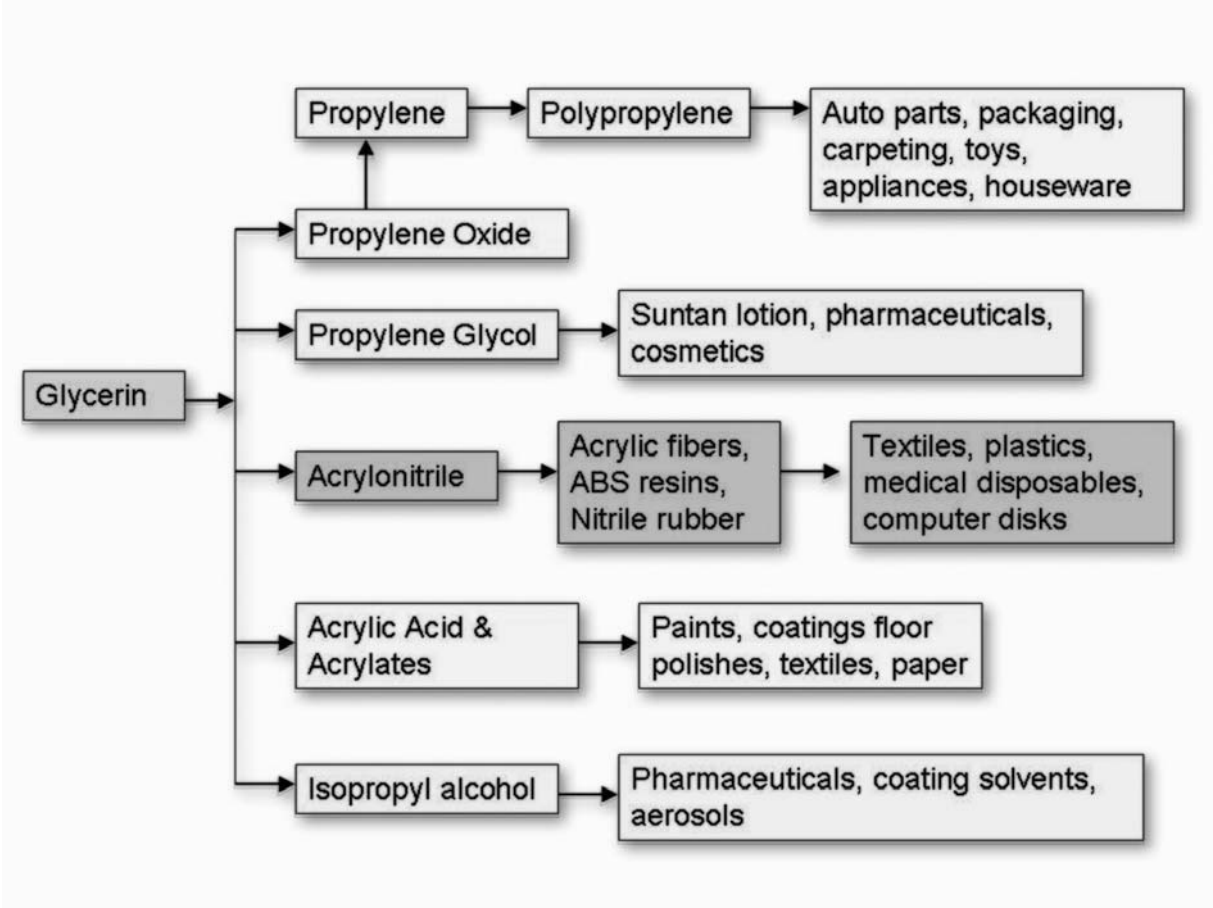
MPRI's newest focus is the development of new industries that are based on renewable resources, which supply the needed goods and services of the existing industries. This includes converting existing plants to ones based on renewable resources requiring nonrenewable resource supplements. One example is a wind farm that generates electricity using turbines built with materials that required energy from fossil fuels. Another is ethanol from corn that was grown with chemical fertilizers produced from fossil fuels. MPRI sees the development of these industries as an essential component of sustainable development.

Public Service

The MPRI public service program co-sponsored a four-day workshop on Inherently Safer Process Design and Operations. Material from the workshop was integrated into the Institute's Internet courses on safety for continuing professional development for registered professional engineers.

Continuing Education for Professional Engineers

The Institute maintains an extensive Web site that provides continuing professional development self-study courses for professional engineers' PDH requirements. Also available on the Web site **www.mpri.lsu.edu** 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



New industries based on renewable resources may include introduction of glycerin into the propylene production chain. Cost effective routes for converting glycerin to value-added products would be developed.

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 which have immediate and substantial energy savings on 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. These short courses are available on request by contacting the Institute at www.mpri.lsu.edu.

Radiation Safety Office

www.radsafety.lsu.edu
Wei-Hsung Wang, CHP, CLSO - Director

The radiation protection program ensures that the radiation exposure to faculty, staff, students, the general public, and the environment is to be maintained as low as reasonably achievable and the incidental radiation exposure is limited to processes that ultimately benefit society, without hindering legitimate research or realistic teaching objectives.

Currently, there are about 800 approved radiation workers (including 109 principal investigators) and approximately 110 radiation laboratories at LSU, the Agricultural Center (AgCenter), and Pennington Biomedical Research Center (PBRC). The RSO provides training and personnel monitoring for faculty and staff who use sources of radiation and performs routine site surveys and audits, meter calibrations, radioactive waste management, and leak tests of sealed sources to ascertain whether approved radiation laboratories meet federal and state regulations and LSU's Radioactive Material License conditions.

DEQ Inspects LSU Campus

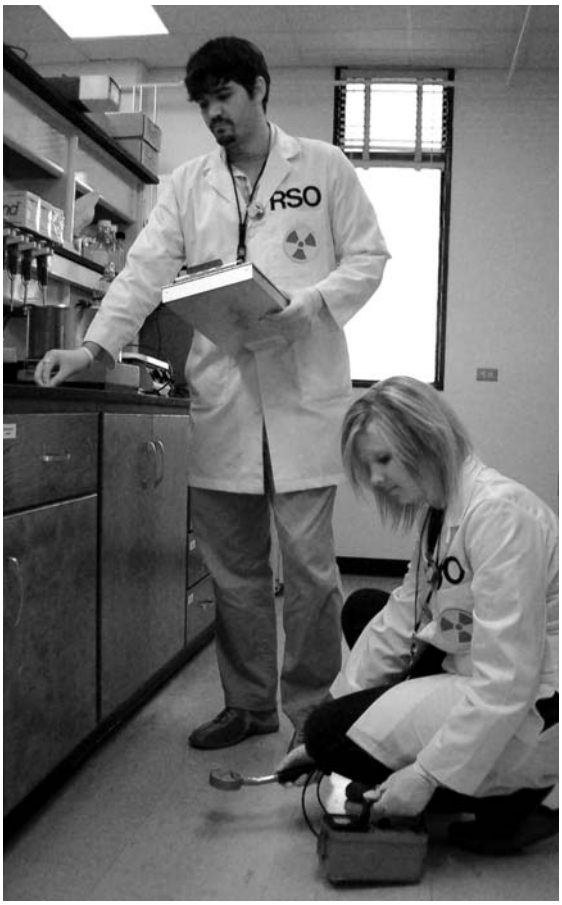
During the past year inspectors from the Louisiana Department of Environmental Quality (DEQ) surveillance division carried out three surveillance inspections of the LSU radiation protection program for LSU, the AgCenter, and PBRC. The inspection included a review and verification of the records of individual radiation exposure monitoring, leak tests of sealed sources, and usage of the irradiator facility, as well as a review of the procedures for radiation user training. Inspectors walked through various types of x-ray units and radiation laboratories to check radiation levels, the function of the units, calibration and condition of survey meters, posting requirements, and security in the laboratories. No violations were cited based on the inspector's observations, and no deficiency was listed on the DEQ's Field Interview Form.

Under the direction and supervision of Wei-Hsung Wang and the Radiation Safety Committee, the Radiation Safety Office (RSO) is responsible for implementing radiation control policies and ensuring safety practice in order to be not only fully in compliance with the federal and state regulations but to also assure individual well-being and the integrity of the University.

RSO Implements Newest NRC Requirements

To increase protection and accountability of radioactive materials in quantities of concern that could potentially be of use to terrorists, in September 2005 the Nuclear Regulatory Commission established additional regulatory requirements to enhance controls over those materials. The RSO has implemented the following main procedures to comply with the new regulatory requirements:

- A background check is mandatory for any individual with the need for unescorted access to facilities containing radioactive materials in quantities of concern. All other personnel must be escorted by an individual with approved unescorted access to the facilities containing radioactive materials in quantities of concern.
- Security systems were installed to immediately detect, assess, and respond to unauthorized access to radioactive materials in quantities of concern.
- A prearranged plan with the Campus Police has been established in response to an actual or attempted incident.
- Each individual with approved unescorted access to the facilities containing radioactive materials in quantities of concern is required to sign a consent notice regarding the pro-



Above: RSO staff perform leak test analysis for the sealed radioactive source using an alpha-beta proportional counter.

At left: RSO staff perform a regular radiation laboratory contamination survey using a pancake Geiger-Mueller probe survey meter and smears.

tection against unauthorized disclosure of the physical protection information for the facilities.

Course Presents Applied Radiation Protection Training

For the past 22 years, the RSO has been sponsoring a five-day course titled "Selected Topics in Radiological Protection." The objective of this course is to present the basic principles of radiation safety to engineers, scientists, managers, and other technical personnel. Attendees have included staff from federal and state regulatory and emergency response agencies, as well as from academic and research institutions, oil and power industry, chemical plants, pharmaceutical companies, and consulting firms. For course information and registration, visit www.radsafety.lsu.edu/shortcourse.html.

Health Physics Society Honors Scott

Health Physics Society Honors Scott with Founders Award

L. Max Scott, radiation safety officer for the LSU System and adjunct associate professor of physics and astronomy, was awarded the Health Physics Society (HPS) Founders Award honoring outstanding professional accomplishments in radiation protection. Scott received the award during the HPS Annual Meeting in Providence, Rhode Island, June 27. The award recognizes exceptional service to the HPS and the health physics profession and earns Scott lifetime membership in the society.

L. Max Scott

Scott, a certified health physicist and a fellow of the HPS, has spent more than 45 years in the practice of health physics. He began his professional experience at the Oak Ridge, Tennessee, Y-12 Plant in 1961, where he administered the first in vivo monitoring program for uranium. He has coauthored defining papers on uranium detection and exposure evaluation, and has earned a reputation as an international authority on internal dosimetry bioassay and in vivo monitoring.

Since 1985, Scott has served as the radiation safety officer for the LSU System, which includes the medical schools, dental school and satellite campuses. He is directly responsible for the implementation and review of compliance with regulations and policies to assure the proper and safe usage of sources of radiation. Scott continues to teach medical physics courses on a part-time basis.

Budget Summary

The Center and its reporting units expended some $5.3+ million during the past fiscal year, not including employee fringe benefit costs. Of our total expenditures, only 39.6 percent were from state general funds, which is probably an all-time low. Budget cuts to our state funds, combined with an increase in grant and contract activity (which accounted for 54.6 percent of our expenditures), accounts for the reduced portion of state general funds. Self-generated revenue from direct sales and services and expenditure of funds on deposit in the LSU Foundation each represented 2.5 percent of expenditures. During FY 05-06, the division supported a staff of 50+ full- and part-time employees, 14 graduate students, and 16 student workers.

Contributors

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Louisiana Department of Economic Development
Louisiana Department of Natural Resources
NewSouth Energy, LLC
Shell
Southern Strategy Group
Suez Energy

Please accept our apologies if we have inadvertently omitted any individual or organization.

Organizational Chart