

Center for Energy Studies

Louisiana Applied and Educational Oil Spill
Research & Development Program

Louisiana Geological Survey

Radiation Safety Office

LSU

Annual Report 2007



Contact Information

LSU Center for Energy Studies

1067 Energy, Coast & Environment Building
Louisiana State University
Baton Rouge, LA 70803
Telephone: 225-578-4400
Fax: 225-578-4541
Web site: www.engr.lsu.edu

Louisiana Applied and Educational Oil Spill Research & Development Program

258 A&B Military Sciences Building
Louisiana State University
Baton Rouge, LA 70803
Telephone: 225-578-3481; 225-578-3477
Fax: 225-578-0403
Web site: www.osradp.lsu.edu

Louisiana Geological Survey

3079 Energy, Coast & Environment Building
Louisiana State University
Baton Rouge, LA 70803
Telephone: 225-578-5320
Fax: 225-578-3662
Web site: www.lgs.lsu.edu

Radiation Safety Office

112 Nuclear Science Building
Louisiana State University
Baton Rouge, Louisiana 70803-5820
Telephone: 225-578-2008
Fax: 225-578-2094
Web site: www.radsafety.lsu.edu

On the cover: "Radiance" by Jim Sanborn, on the rotunda terrace of the Energy, Coast and the Environment Building, provided by the Louisiana Percent for Art program. The work features four bronze cylindrical elements with water-jet cut passages of text in several languages perforating the pieces. The texts include selections and references to exploration, the environment, earth science, plate tectonics, oil, and early inhabitants.

Addressing Louisiana's Emerging Energy Imperatives

A common mental image of the “energy problem” is that of a race, with fuels and technologies as the competitive contestants, each working to reach the finish line first in order to keep our SUVs and air conditioning running. The problem with this image is that the dimensions of energy consumption and supply indicate that none of the traditional or emerging sources or technologies alone can “solve” the energy problem—as fossil fuels have in effect done for the past century or so. Further, the consensus seems to be that as modern economic infrastructure and institutions spread across the continents, traditional fossil fuel-based technologies, even if adequate supplies were available, pose unacceptable risks to the world’s environmental and climate systems.

Powering the future economy will require that we: 1) maintain the old energy sources, 2) develop and commercialize several major new ones, and, simultaneously, 3) implement a phalanx of aggressive and creative strategies to protect the climate and environment.

Each energy source, and each energy-producing or energy-saving technology, has its own unique set of strengths, limitations, and unwanted by-products and effects. Commercial, scientific and engineering considerations, moreover, are not sufficient to classify and evaluate them. In fact, in public policy discussions such considerations often seem to be secondary to social, political, and ethical considerations that are harder to articulate and understand.

The newly prominent role in contemporary politics of predictions and warnings about changes in the average ambient air temperature or in the average sea level, as they will be experienced by the current generation’s grandchildren signals a new level of complexity for contemporary energy policy.

Governments have had neither much experience nor much success in dealing with such long-term, intergenerational problems. Moreover, changes in climate and sea-level are global rather than national, regional, or local phenomena, and their inertia maintains trends for centuries rather than years or decades. Even the largest, wealthiest, or most technically advanced countries cannot isolate themselves from their consequences. Only rudimentary governmental institutions and agreements exist to deal with the consequences of global climate change, and nationalistic resistance to giving any international institution adequate authority to do so is strong—even if there were sufficient understanding and consensus to agree about what should be done.

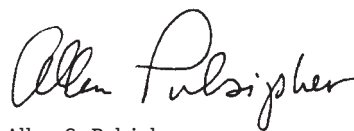
Thus the larger problem is that unless a very large part of mankind adequately addresses the new energy situation successfully, no one’s grandchildren are going to arrive at their destiny in comfort and with dry feet.

With the nation’s most energy intensive economy, Louisiana uses more energy per dollar of gross state product than any other state—both in terms of consumption and production. Thus Louisiana may have a bigger stake in how energy/climate/environmental policy evolves than any other state. It needs a forward-looking, objective, and comprehensive map that indicates both the positive opportunities as well as the negative consequences of the new energy imperatives.

The Center for Energy Studies is not in the business of solving intergenerational, global problems, our hands full with present-day Louisiana. Instead, it is targeting its new initiatives on three, forward-looking aspects of today’s energy realities of special importance to the state, namely *determining the implications of approaches to climate change regulations for Louisiana; providing a University-based Louisiana alternative energy information and technology transfer exchange; and maintaining Louisiana’s energy revenues*. The Center pursues these institutional aspirations while maintaining its ongoing, successful, research and public service program in oil and gas exploration and production, mid-stream natural gas and petroleum processing and refining, and downstream retail electricity and natural gas markets.

Contributing to Louisiana’s economic development is a fundamental objective of the University’s Flagship Agenda, as are the protection of the state’s environmental amenities and the restoration of the state’s endangered coast. Examining the numerous industry, technological, and policy factors impacting the relationship between the state’s energy infrastructure and environment is a contribution that each of Center’s units plays in this important economic development charge. The following pages describe the efforts of the Center and its reporting divisions—the Louisiana Applied and Educational Oil Spill Research & Development Program, the Louisiana Geological Survey, and the Radiation Safety Office—to fulfill their unique missions in support of the Flagship Agenda.

In all of its efforts, the Center seeks to be a reliable, authoritative, and nationally visible source of information and analysis on energy and energy-related issues by providing a balanced, objective, and timely treatment of issues with potentially important consequences for Louisiana.



Allan G. Pulsipher
Executive Director
LSU Center for Energy Studies



New Energy Initiatives

In addition to its ongoing research and public service programs, CES is pursuing new initiatives that address 21st century energy issues for the state.

Implications of Approaches to Climate Change Regulations for Louisiana



Mike McDaniel, CES Professional-in-Residence

The United States has not participated in the principal international agreement nor adopted a mandatory national regulatory strategy for global warming. However, all but 20 states have prepared or are in the process of preparing “Action Plans” to mitigate or control greenhouse gas emissions, and nine of the 20 states without an action plan are participating in one of the five, regional, multi-state greenhouse gas initiatives. Louisiana is one of only eleven states with neither an action plan nor membership in one of the regional initiatives.

If a regulatory strategy were to be adopted at the federal level it may be administered nationwide, or, as is the case with many environmental statutes, at the state-level with federal review and oversight. Those states with Action Plans or that are members of regional coalitions may have an advantage in influencing any federal proposals to better suit their economic and geographic circumstances or legislative preferences simply because they may have better information and more analytical experience in dealing with the relevant data, potential regulatory constraints, and their environmental and economic consequences.

Strategies and proposals for regulating greenhouse gases vary considerably in terms of methods, scope, and timing. Tax bases and rates, total emission limits or targets, how emissions are measured, trading emission rights or reductions among jurisdictions, target dates, penalties and enforcement mechanisms are among the variables under consideration. Individual states and regional entities will be affected differently by different strategies and plans according to their economic, ecological, and geographic characteristics.

As a state that is energy intensive with limited economic diversity and an extensive, atypical, agricultural sector, Louisiana may be affected more consequentially by some approaches or proposals than by others. Similarly, internally, some industries or sectors of the state’s economy will fare better under some proposals than they will under others and should be expected to advocate those favorable to their interests. In these circumstances Louisiana’s public- and private-sector leadership needs to be fully and objectively informed about how alternative proposals to address greenhouse gases will affect the citizens, businesses, and political jurisdictions of the state.

Mike McDaniel, an environmental scientist who headed the Louisiana Department of Environmental Quality for the past four years, has joined the Center as a professional in residence and will focus on the need to be able to evaluate alternative approaches, legislation, and proposals regarding climate change regulations for Louisiana. The first phase of the effort will be an inclusive, participatory study involving both public and private sector participants.

Louisiana is one of only eleven states with neither an action plan nor membership in one of the regional initiatives.

A University-Based Louisiana Alternative Energy Information and Technology Transfer Exchange

Similar issues for the state are raised by the proposals to increase the share or accelerate the commercialization of alternative¹ and renewable energy sources. The Congress has enacted an aggressive program to subsidize some technologies, such as making ethanol from corn, and about half the states have adopted renewable portfolio standards requiring that some percentage of the state's energy come from renewable sources such as wind, solar, or biomass. North Carolina and Texas are the only "southern states" that have adopted renewable standards, and the southeastern states are generally acknowledged to be at a disadvantage with respect to wind and solar technologies.

The variety of policies to promote alternative and renewable energy among the states, and the apparent political popularity of policies to do so, suggests that pressure will build in the private sector for the Congress to pass similar legislation nationally.

Programs associated with new technologies usually focus on the *technical opportunities* for clean energy. While useful in a very broad sense, for a state trying to meet evolving federal standards, the emphasis needs to be placed on facilitating the *economic opportunities* and overcoming potential regulatory and institutional barriers.

The analysis of energy markets and regulation for renewable and alternative energy has become much more complex. In the past, the on-site power generation projects developed in Louisiana were limited to three options: (1) generate a portion of their load on site and purchase the balance from the host utility (like Entergy or Cleco); (2) generate all electricity on-site; or (3) generate all onsite electricity needs and sell any remaining electrical production to the host utility as allowed by state and federal law. The potential gains on power sales to the host utility were limited since the price of power sold by a cogeneration facility to a host utility was regulated.

However, beginning in 1996, wholesale power markets in the U.S. (including Louisiana) were opened to competition. As a result, there are a number of competitive opportunities for new sources of competitive (as opposed to regulated) power generation. The new factors that need to be included in the decision making process, for instance, can include:

- Trends in fuel prices and fuel price volatility;
- Existing generating units that are competing with a potential new on-site or energy efficiency resource;
- New wholesale power generation resources in the state and the future "spark spreads" for wholesale power in the Gulf South;
- The physical transmission constraints that can limit competing generating resources and create regional "load pockets;"
- Effects on net air emissions that include:
 - * the examination of net potential improvements in air quality from power generation and reduced flares created by power outages and interruptions at chemical facilities;
 - * opportunities to increase electrical driven motors that can change overall on-site air emission;

¹ Alternative usually means non-fossil fuels and non-nuclear technologies, although arguments are made that both may be able to help avoid the national security concerns associated with imported oil and gas and contribute less to climate and environmental concerns than many of the alternative and renewable energy sources. We don't try to resolve these differences here and also include energy saving or conserving technologies in alternative energy category.



David Dismukes, CES Associate Executive Director

The variety of policies to promote alternative and renewable energy among the state...suggests that pressure will build in the private sector for the Congress to pass similar legislation nationally.

Decisions about where to explore, what to develop and how long to produce, when oil is selling for more than \$100 per barrel, are quite different than corresponding decisions made when oil is selling for \$2 per barrel.

- * the potential value of tradable air emission credits resulting from more efficient power generation and increased electrification of on-site processes.
- Maximizing the profitability of on-site power generation capacity decisions to consider:
 - * Gains on potential sales in competitive wholesale markets;
 - * Reduction of costs at other facilities through affiliate wheeling (i.e., transportation) opportunities; and
 - * Reduction of on-site power usage costs and the use of a physical asset like power generation as a hedge on future electrical price volatility.

The Center for Energy Studies has long standing experience in such aspects of the state and region's energy markets and their regulation. These are the markets into which new alternative and renewable suppliers will be selling their output. Understanding how they work, and are regulated, will be of critical importance. This applies to a wide range of applications that reaches beyond agricultural and bio-based energy technologies.

David Dismukes, associate executive director of the Center, is working with state agencies and others to try to design a cooperative program to make this expertise available to entrepreneurs and operators in Louisiana. The goal is to create a program whereby the wide range of resources that are located and available within the University to support alternative and renewable energy are identified and that objective, independent experts on energy-related issues, policies, and markets are available for linking suppliers (developers), investors, buyers, and the public at large.



Maintaining Louisiana's Energy Revenues

Petroleum production in Louisiana peaked in 1972. Since then the decline has been steady and the state is classified as a mature petroleum producing region.² But revenues from taxes on petroleum production within Louisiana's jurisdiction, as well as royalties from state-owned lands and water bottoms, are still important contributors to the state's budget—especially at today's historically high oil and gas prices.

In 1972 when production in Louisiana peaked, oil sold for about \$2 per barrel. Decisions about where to explore, what to develop and how long to produce, when oil is selling for more than \$100 per barrel, are quite different than corresponding decisions made when oil is selling for \$2 per barrel—even ignoring the very considerable improvements in the technology available today to find and produce petroleum.

Thus the state's mature resource base developed under \$2 barrel oil is a much more valuable natural resource in a world in which oil is selling at close to \$100 barrel. There are two aspects of realizing this potential (with respect to the state's economic activity as well as its own revenues) where the Center and the University are especially well positioned to make a contribution.



Improving the Louisiana Geological Survey's Resource Center

The Louisiana Geological Survey's Resource Center is the principal repository of information and analysis concerning the geologic foundation of the state's energy resource base. It is in two parts; an extensive collection of logs showing data from approximately 60,000 wells that have been drilled in the state, approximately 30,000 feet of physical cores that were extracted for analysis and storage during the drilling process. This information is not available from any other source nor in any other form. It is increasingly relevant not only for oil and gas exploration and geological research but for emerging topics such as carbon sequestration.

Currently the Resource Center is housed in two separate locations, only one of which is on the campus, and neither is easily accessible. More importantly, the main reposi-

² But petroleum processing and transportation have grown with the national economy. Although today most of the crude oil they process is imported from other countries or produced under federal jurisdiction on the outer continental shelf, the state's refineries are as efficient as any in the world and export significant volumes of their production to other regions of the country.

LGS Core Repository.

tory building is scheduled to be demolished to clear the site for the new building to house the College of Business. Given the new outlook for much higher oil and gas prices, the improvements in the technology and economics of additional recovery and production from mature fields, and the increasing relevance of geological carbon sequestration, it seems both a prudent and propitious time to make this unique resource more easily available to potential oil and gas developers as well as to students and faculty by making it more accessible and easier to use. In the 2005 energy bill \$30 million per year for five years was authorized to make this sort of geological information more readily available. Only a small proportion of this authorization thus far has been appropriated. But this emphasis remains a priority of the U.S. Geological Survey and more federal funding may become available. Regardless of what happens at the federal level, however, given Louisiana's unique set of circumstances the relatively modest cost may warrant direct support.

Transferring Oil and Gas Technology to Independent Producers

Since 1995 the Center for Energy Studies has been a part of a federal program to transfer information and technical expertise to smaller, independent oil and gas companies—the Petroleum Technology Transfer Council (PTTC). For several years the administration has eliminated money for oil and gas research (and the PTTC) from its budget maintaining that much higher prices and profits in the oil and gas industries made such subsidies unnecessary. However, the Congress regularly had added funds to the federal budget to maintain the PTTC program—until this past year.

The oil and gas industry has extensive and remarkably successful research and development programs that are internally financed. The rationale for the PTTC was that industry R&D programs are carried on by the very large companies who consider them to be proprietary and confidential. Small independent companies do not have the resources to conduct such programs, and further, if they were to do so, could not keep their results confidential.

For states like Louisiana with a mature resource base, this causes unique problems because for the past decade and a half the large companies have been leaving the state to pursue new fields in the offshore and in other countries. As they have done so, they have sold their Louisiana reserves to smaller, independent companies. The technical and entrepreneurial capability of small independent companies bears directly on the revenues and economic activity that the state can expect to derive from its mineral reserves.

As it was implemented in Louisiana, the PTTC program had two basic components. The first was a series of technical workshops for small independent operators organized and coordinated by Don Goddard, the Center's PTTC coordinator working in cooperation with the Louisiana Geological Survey, LSU's Craft & Hawkins Department of Petroleum Engineering and the Louisiana Department of Natural Resources. A producer advisory group (PAG) oversaw the program and insured their relevance to small producers. The workshops were well received and well attended.

The second aspect of the program involved support for projects that were often organized by the faculty and students in the petroleum engineering department and were of special relevance for the development of mature resources by smaller companies in the Gulf Coast region.

The workshop component has been partially preserved by the American Association of Petroleum Geologists (AAPG) who have taken over responsibility for the national PTTC program and implemented guidelines designed to make the workshops more self financing. There is no financial support, however, for the program's second, more targeted technology transfer aspect conducted in conjunction with the University's petroleum engineering department. Approximately \$250,000 annually is needed to continue this aspect of the program at its past activity level.



In 2007, Don Goddard was named director of the PTTC Central Gulf Region after having served as coordinator of the program since 2000.

Accomplishments and Contributions

The Center pursues new institutional aspirations while maintaining its ongoing, successful, research and public service program. Contributing to Louisiana's economic development is a fundamental objective of the University's Flagship Agenda, as are the protection of the state's environmental amenities and the restoration of the state's endangered coast.

In Louisiana, energy production and consumption are closely intertwined with these three objectives. The Center seeks to be a reliable, authoritative, and nationally visible source of information and analysis on energy and energy-related issues by providing a balanced, objective, and timely treatment of issues with potentially important consequences for Louisiana.

During the past decade the Center has recruited and retained a core research staff that has steadily gained national credibility and visibility. The quality and quantity of CES research has increased substantially as has its external funding. The Center has diversified its multidisciplinary breadth and extended its topical expertise. It has implemented an active and effective program of public outreach, education, and technology transfer and is more visible nationally and within the state than it has ever been.

CES is a link between LSU and some of LSU's most important economic constituencies. Its visibility and activity are signals that the state's flagship university recognizes that energy producing and consuming industries are consequential components of its economy. As such, energy is as deserving of objective, accurate, and timely information and analysis as any other important component of the state's economy—such as, for example, agriculture. The Center's organizational imperative is to continue to strengthen and improve the links between the activities and interests of its staff and those concerned with energy issues and policies.

Building and maintaining these links does not imply that CES research is one-sided or promotes a preconceived argument or position. There are many consulting and government relations companies that are able to provide research and analysis that will support any given case. Indeed, the Center's "distinctive competence," in planning jargon, is that its studies and reports are objective, balanced and credible.

CES research and analysis is communicated in a wide variety of ways. Conversations with reporters or other researchers, responding to inquiries from public officials, testifying at public hearings, giving talks or presentations at professional or scholarly meetings, are important avenues of communication. Externally funded studies are normally summarized in research reports directed to the sponsoring agency but available to the public at large. Often research projects are closely related to the scholarly interests of the investigators and are leveraged into other articles and publications, as well as follow-on projects.

Figure 1 shows the number of articles and reports published by CES staff members on an annual basis. The increase reflects shifting resources and strategies through time, but it also illustrates the progression toward a more formal and scholarly strategy for the dissemination of the staffs' work. The Center's list of publications is posted on its Web site.

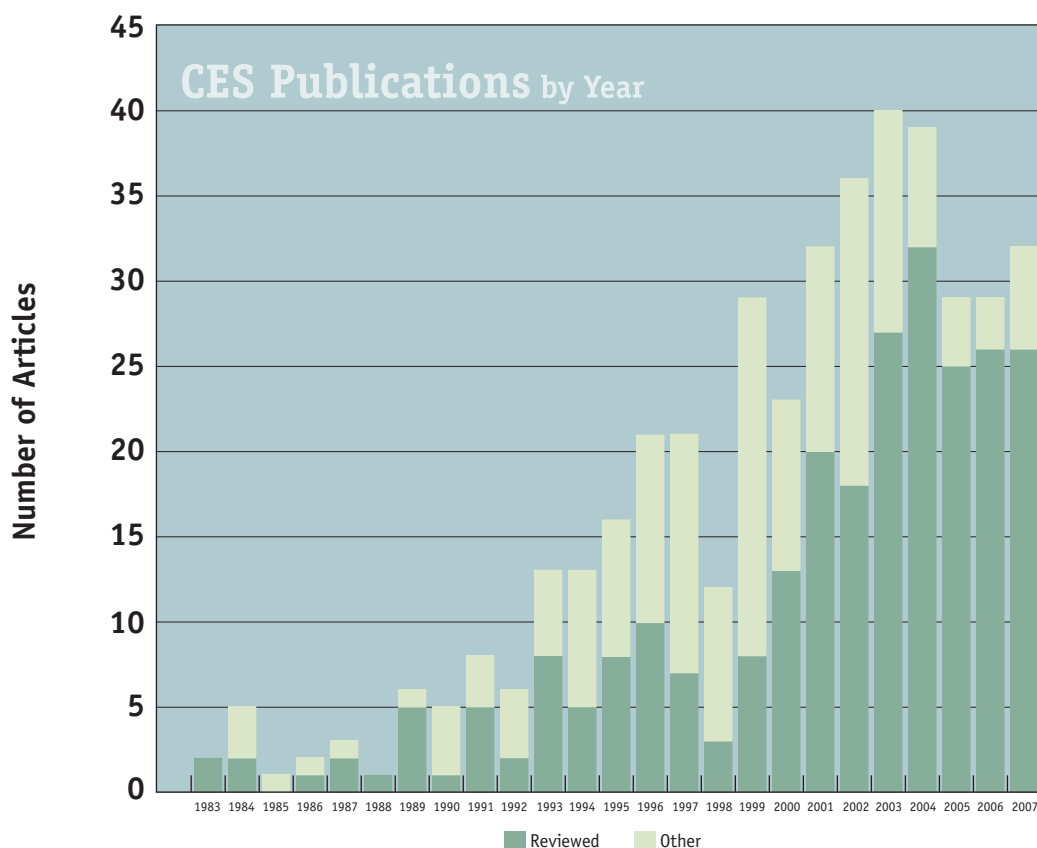
The recruitment, development, and retention of a multidisciplinary team of research faculty are the most significant accomplishments of the Center in its current configuration. The University now has an active and accomplished intellectual core in an area which once again occupies a prominent place on the state and nation's public policy agenda. This is a timely and valuable asset for the University and the state.

Wumi Iledare and David Dismukes both joined the Center at the assistant professor rank and are now research professors widely recognized by their peers. Iledare is the current president of the U.S. Association for Energy Economics, the principal professional organization for energy economics, and edits the association's official



Wumi Iledare is president of the U.S. Association for Energy Economics.

Figure 1



publication *USAEE Dialogue*. He is recognized as an expert on oil and gas economics and the West African oil fields, where he regularly travels and lectures. David Disimukes is the state’s most visible public utility economist. He speaks regularly to the plenary sessions of the National Association of Utility Regulatory Commissioners (NARUC) as well as the National Association of State Utility Consumer Advocates (NASUCA).

Mark Kaiser, who joined the Center at the associate professor level but with limited prior experience in energy issues, is now the nation’s expert on several aspects of the engineering and economics of the installation, operation, and removal of offshore oil and gas structures. Mark has published many more articles in the *Oil & Gas Journal*, the industry’s bible, than any other academic (and probably any other contributor) during the same period.

Donald Goddard plans and administers the Center’s programs to assist independent petroleum producers. He also conducts geological research on regional reserves, including a major project in cooperation with the University of Alabama.

Ralph Pike directs the Minerals Processing Division. Along with his associate Carl Knopf, Ralph is an expert on the energy-intensive chemical and refining industries that are the foundation of the state’s industrial economy. As the nation seeks to develop alternative energy resources, such as ethanol and other biomass based fuels, both problems and opportunities are created for conventional oil, gas, and chemical infrastructure—with respect to not only technology but also to its commercial and regulatory aspects. The Minerals Processing division extends and complements the Center’s analytical capabilities in these areas.

Mike McDaniel joined the Center in January 2008 as a Professional in Residence. McDaniel, an environmental scientist who headed the Louisiana Department of Environmental Quality for the past four years, will direct the Center’s initiatives on climate change and energy, as well as assist in the Center’s ongoing work in renewable and alternative energy and energy efficiency.



In 2007, Mark Kaiser’s published research included serial articles for the *Oil & Gas Journal* on estimating drilling costs and offshore energy loss.

Minerals Processing Research Division Explores Industries in Transition

The Gulf Coast region is in a transition not ever experienced in the nation's history. Losses from natural disasters, plants relocating to other parts of the world, and competition from imports require a new vision and direction. A new strategy in the CES Minerals Processing Research Division integrates research and economic evaluation in the complex interplay of biological primary productivity, renewable energy sources, and new industrial products from biomass and carbon nanotubes, all with a focus on sustainable development.

The vision is the development of new industries in the region that are based on renewable resources that supply the products and services of the current ones, including transitioning existing plants to ones using biomass feedstocks that require nonrenewable resource supplements. The chemical complexes in the Gulf Coast are uniquely positioned to take advantage of bio-derived feedstocks. There is strong agricultural industry in the region, and the Mississippi River provides deep-water ports to ensure continuous bio-based feedstocks throughout the year. Research is driven by a desire to understand how sustainable industries can evolve from ones based on non-renewal resources.

Using the Chemical Complex Analysis System, the initial evaluation is to have ethanol go into the ethylene chemical product chain and glycerin to go into the propylene product chain. Ethanol is too valuable a commodity for the manufacture of plastics, detergents, fibers, films, and pharmaceuticals to be used as a motor fuel. Glycerin is used for plastics, antifreeze, and polymers. This evaluation is including algae, which have the potential for being an important source of oil and carbohydrates for chemicals with yields of 15,000 gallons/acre of oil.

In Figure 1, conversion routes are shown for biomass and biofuels feedstock to chemicals. The feedstocks, including oils, sugars, starches and cellulose, are shown in the green boxes. Products are shown in red boxes, including plastic intermediates such as 1,3-propanediol, ethylene, and its derivatives, such as polyethylene and polyvinyl chloride (PVC), acetic acid, and a host of other specialty chemicals. The processes used for these conversions are plants shown in the orange boxes with intermediate products and associated processes in blue boxes. This complex has methanol from synthesis gas (syngas) being used in transesterification of vegetable oils. A process for carbon nanotubes uses carbon monoxide from biomass gasification.

The objectives are to identify and design new industrial processes that use biomass and biofuels as raw materials and show how these processes could be integrated into existing chemical production complexes. Also, the results will show how existing plants can transition to renewable feedstocks from nonrenewable feedstocks.

The chemical production complex in the lower Mississippi River corridor is being used to demonstrate the integration of these new plants into an existing infrastructure of plants. Research involves collaboration with process and plant engineers with Monsanto, Motiva Enterprises, Mosaic Inc. and others. Potentially new processes are evaluated based on selection criteria, and simulations of these processes are performed. Then the optimal configuration of new and existing plants is determined by optimizing the triple bottom line based on economic, environmental, and sustainable costs using the Chemical Complex Analysis System.

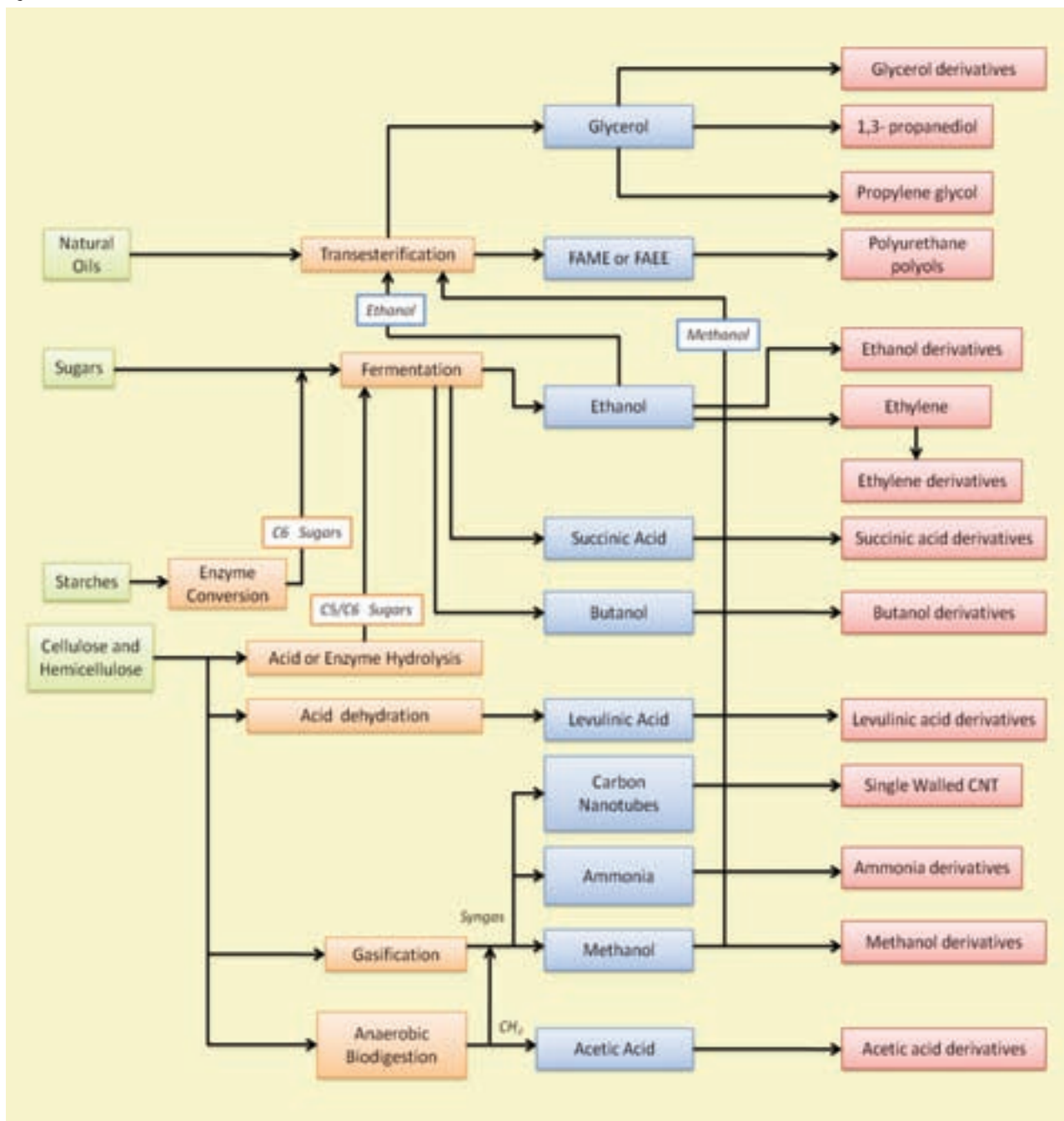
Chemical complex optimization is a powerful methodology for plant and design engineers to convert their company's goals and capital to viable projects that meet economic, environmental, and sustainable requirements. The optimal configuration of plants in a chemical production complex is obtained by solving a mixed integer nonlinear programming (MINLP) problem. The chemical production complex of existing plants in the lower Mississippi River corridor is being used as a base case for evaluating the additions of new plants that used biomass, biofuels and carbon dioxide as raw materials. These results are applicable to other chemical production



Ralph Pike directs the Minerals Processing Research Division.

Research is driven by a desire to understand how sustainable industries can evolve from ones based on non-renewable resources.

Figure 1 Conversion Routes of Biomass Feedstock to Chemicals





complexes in the world, including those in the Houston area (largest in the world), Antwerp port area (Belgium), BASF in Ludwigshafen (Germany), Petrochemical district of Camacari-Bahia (Brazil), the Singapore petrochemical complex in Jurong Island (Singapore), and Equate (Kuwait), among others.

A White Paper titled "Integrating Biomass Feedstocks into Chemical Production Complexes using New and Existing Processes" that gives a detailed description of the conversion of biomass and biofuels to chemicals is available on the Mineral Processing Research Division's Web site, www.mpri.lsu.edu. Additional materials are available at this Web site as described below.

Continuing Education for Professional Engineers

The MPR Division 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 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, and these short courses are available on request by contacting MPR at www.mpri.lsu.edu.

Conference Center Update

During 2007, the Woods Auditorium, rotunda lobby, and conference room were venues for 243 events. In-house use accounted for approximately 68 percent of the meetings held in the center (the School of the Coast and Environment hosted 152 events, CES hosted 10, and Louisiana Geological Survey hosted five). Other LSU unit events represented 25 percent; and non-LSU organizations scheduled 7 percent of the events held.

CES Events

On April 25, 2007, CES hosted "Alternative Energy 2007: Seizing Opportunity in an Expanding Energy Marketplace" The conference addressed wind and wave energy, opportunities and new projects in bioenergy, advances in biofuels, investor expectations, the Renewable Energy Certificate (REC) market, and recent trading developments. The annual fall conference was held October 24. "Energy Summit 2007: Charting a Course through an Uncertain Energy Environment," focused on future horizons in the energy business and energy policy, with an emphasis on climate change. Presentations from both conferences are available online at www.enrg.lsu.edu/conferences.

On November 13, 2007, CES co-hosted with ConocoPhillips a "Conversation on Energy" roundtable. The afternoon forum for the campus community, held in the Woods Auditorium, featured a roundtable discussion on energy, the environment, and the economy. James Richardson, director, LSU Public Administration Institute, Carl Knopf, professor, LSU chemical engineering, along with ConocoPhillips' Phil Frederickson, executive vice president, technology, and Sabrina Watkins, manager, environmental technology, participated in the discussion. That evening, the larger community was invited to attend a similar roundtable discussion at the Baton Rouge River Center, also cohosted by CES and ConocoPhillips. David Dismukes moderated both discussions.

Also in November, CES and the Department of Environmental Studies co-sponsored a presentation by Mike McDaniel, secretary of the Louisiana Department of Environmental Quality, whose topic was "Topics in Louisiana Energy and Environmental Regulation."

Earlier in the year, CES hosted a meeting to present findings of the project "History of the Oil & Gas Industry in Southern Louisiana," a collaborative effort with the New Orleans Region of the Minerals Management Service of the U.S. Department of the Interior, the University of Arizona, the University of Houston, and the University of Louisiana at Lafayette. The multi-year project documented and analyzed Louisiana's offshore industry and the people and communities affected by its growth. Presentations included a summary discussion of the papers, interviews, and materials collected during the course of the project and plans for archiving.



Attendees listen to a Louisiana bioenergy roundtable discussion at the Alternative Energy conference in April 2007.



Chacko John, director of the Louisiana Geological Survey and State Geologist, is president of the American Association of State Geologists.

Each of the fifty states and the federal government have an organization to conduct geological research on natural resources and the environment and to render services to supply data and technical support to other state and federal agencies, municipalities, the general public, industry and academia. In Louisiana, the Louisiana Geological Survey (LGS) performs these functions. The LGS was first organized in 1869 and was permanently established in 1934 by Act 131 of the Louisiana State Legislature. LGS was transferred to the Louisiana State University in July 1997 by an Act of the Louisiana legislature during its regular 1997 session (HB2353). LGS reports through the Executive Director of the Center of Energy Studies to the LSU Vice-Chancellor for Research and Economic Development.

The LGS currently functions as a research unit working on geoscience projects to accomplish its mission of providing unbiased geological and environmental information to promote environmentally sound economic development of energy, mineral and water resources of the state.

Basin Research Energy Section Responds to Industry Needs

Industry interest and requests for obtaining available geological and production information on oil & gas fields of the state and the potential for coalbed methane production and other alternate energy resources helped identify the projects being undertaken in the Basin Research Energy Section of LGS. Summaries of projects in this section are given below.

Atlas of Oil and Gas Fields in Offshore Waters of Louisiana (Volume III, Main Pass Area)

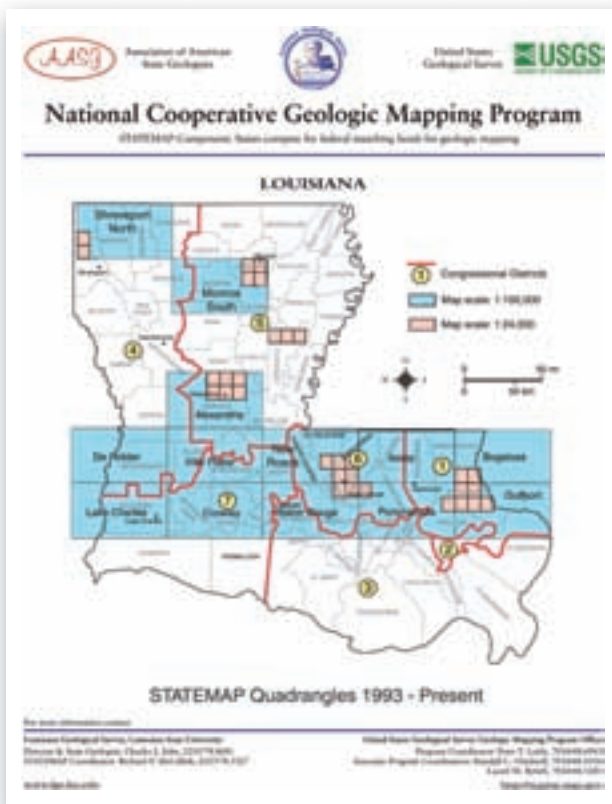
This is the third Atlas being compiled in the series of offshore atlases, the earlier ones completed were for Breton Sound and the Chandeleur area. This Atlas, like the previous ones, will provide a single source reference to geological and production information for the Main Pass Area. Information will include a history of the oil and gas activity, an electrical log showing the producing horizons and formation tops, geological structure maps, crosssections, and production history. This volume is expected to be available August 2008.

Potential for Coalbed Methane (CBM) Production in North Louisiana

The presence of lignite seams in the Paleocene-Eocene Wilcox Formation in North Louisiana is well documented and has been a topic of research by LGS, in collaboration with the University of Louisiana at Lafayette (ULL) and the U.S. Geological Survey. LGS is currently working to produce a publication detailing the potential for coalbed production in North Louisiana which will include a real extent of the reservoirs, maps, and crosssections and what production information may be available. LGS maintains an electronic database of wells being drilled targeting CBM in Louisiana. Information for this database primarily comes from the Louisiana Department of Natural Resources SONRIS online database system.

Tuscaloosa Marine Shale Trend (TMS)

The LGS published a report in 1997 titled "An Unproven Unconventional Seven Billion Barrel Oil Resource-the Tuscaloosa Marine Shale." The TMS is found at depth of approximately 10,000'-12,500' in southeastern Louisiana and Southwestern Mississippi and contains oil deposits which conventional development methods have been unsuccessful



in producing commercially. Significant advances in drilling technology since that time and the success of these methods in the Barnett Shale of Texas and other areas have now made the TMS an attractive exploration target and industry has expanded its activity in the TMS trend. LGS continues to monitor the industry activity in the TMS trend as successful exploration would lead to considerable economic benefits to the state and the local areas.

Oil and Gas Field Map

LGS is in the final stages of producing an Oil and Gas Field Map of Louisiana which is expected to be ready for distribution by the time of publication of this report. See page 24 for more information.

National Coal Resources Data System (NCRDS)

The LGS is expanding upon its National Coal Resources Data System point source and mapping work on the Big and Russell Coals of the Central Louisiana Coal Bed Methane Basin by preparing a digital Atlas of this basin over a five year period (2004-2009). This atlas will contain maps, illustrations, cross-sections, models, and resource assessment information.

New and Updated Geologic Maps Available

Geologic maps illustrate the land surface and depicts the distribution of rock types with their description, ages of rock units, geologic features such as faults, and location of mineral resources etc. While geologic maps are critical for understanding the geology of the area, they are also often used for creation of derivative maps to serve specific engineering needs and siting of industrial plants. Interpreting the geology in coastal plain settings such as in Louisiana tends to be subtler and less dramatic than in most other settings, and coastal-plain geology presents its own unique problems.

The primary responsibility of the LGS Geologic Mapping and Mineral Resources Section is the continued production of geologic maps of the state at 1:100,000 and 1:24,000 scales. LGS has so far published ten 1:100,000 scale geologic quadrangle maps as lithographs, which are available for sale from the LGS publications.

Geologic Mapping and Mineral Resources Section Research Projects

Projects include:

Geologic mapping of Hatchersville and Greensburg 7.5 Minute Quadrangles, and Recompile and Digital Production of Amite 30 x 60 minute Quadrangle, Louisiana.

Geologic mapping of Port Hudson, Zachary, and Fred 7.5 Minute Quadrangle and Recompile and Digital Production of the New Roads 30 x 60 Minute Quadrangle, Louisiana.

A new revised and updated 8.5 x 11 inch generalized geology map of Louisiana with a geological description of the map on the reverse side has been published and available for distribution free of charge on request from LGS publications. This map has proved to be much in demand from school teachers.





Research associate Patrick O'Neill records GPS points for mapping pipeline crossings along a state highway in Assumption Parish.

LGS Cartography More than Maps

The LGS Cartographic Section specializes in the compilation, design, and production of high quality maps, posters, technical publications, desk-top publishing, and geophysical information systems. Most cartographic projects conducted are funded by sponsored research contracts from various sources including state and federal agencies, professional societies and groups, individual researchers from other universities, and other LSU departments. Cartographic products were produced for the Barataria-Terrebonne National Estuary Program, Fermata, Louisiana Oil Spill Research and Development Program, Department of Environmental Quality, Coalition to Restore Coastal Louisiana, Center for Energy Studies, Coastal Studies Institute, and the LSU Sea Grant. Cartographic Section research projects include:

Research and Development of a Geographics Information System (GIS) of Petrochemical Pipelines between Baton Rouge and New Orleans, Louisiana

This project is intended to supplement emergency responses and planning for possible hazardous materials spills emanating from petrochemical transmission pipelines that crisscross the area between Baton Rouge and New Orleans. This research and development of digital pipeline data is focused on buried and exposed petrochemical transmission pipelines. Transmission pipelines are typically those with diameters greater than 4 inches. Gathering or distribution lines are typically not included (only included if spatial confidence was high). To date, roughly 3,000 miles of pipelines have been mapped for 47 operators in this study area. Other areas previously mapped are Calcasieu Parish, Lafayette vicinity, and the New Orleans area. This includes, but is not limited to, emergency contacts and links to emergency response field guides (U.S. DOTD) Emergency

Response Guidebook-2004). Damage to pipelines can be dangerous to the environment and public. Consequences of pipeline failures include explosions or inhalation hazards causing injury or even fatalities. Many products transported by pipelines are colorless, tasteless and odorless, making leak detection by the public difficult. These data are designed for use for first responders as well as planners, pipeline contractors, and the petroleum industry. Development of digital pipeline data is crucial for effective energy planning, environmental monitoring, disaster prevention, and emergency preparedness.

Digital Pipeline Data Development for the University of Louisiana at Monroe

Subcontract with Dr. M. Camille (ULM) to develop digital pipeline data for the northern part of the state. Similar to the other pipeline mapping projects for the Oil Spill Research and Development Program (OSRADP).

Mapping Support of Board of Regents/LSU Hurricane Center Project

A five-year sponsored research project to research, create, and obtain GIS data and remote sensing imagery of the study area; to compile and develop an interactive on-line GIS; and to publish maps and posters for the project.

Louisiana Oil and Gas Field Compilation and Map Production

A one-year sponsored research project to digitally compile the oil and gas fields of Louisiana into a GIS and to publish a wall map of the same.

Pipeline Crossing Investigation of Louisiana Waterways

A series of sponsored research projects to conduct field investigations and to create a GIS and map set of pipeline crossings by waterway.

Research and Development of a Technical Exhibit

A two-year sponsored research project to research, develop and prepare a traveling exhibit to showcase Louisiana oil spill coordination, research, and response. The second year includes a video kiosk.

Preparation of Birding Trail Maps

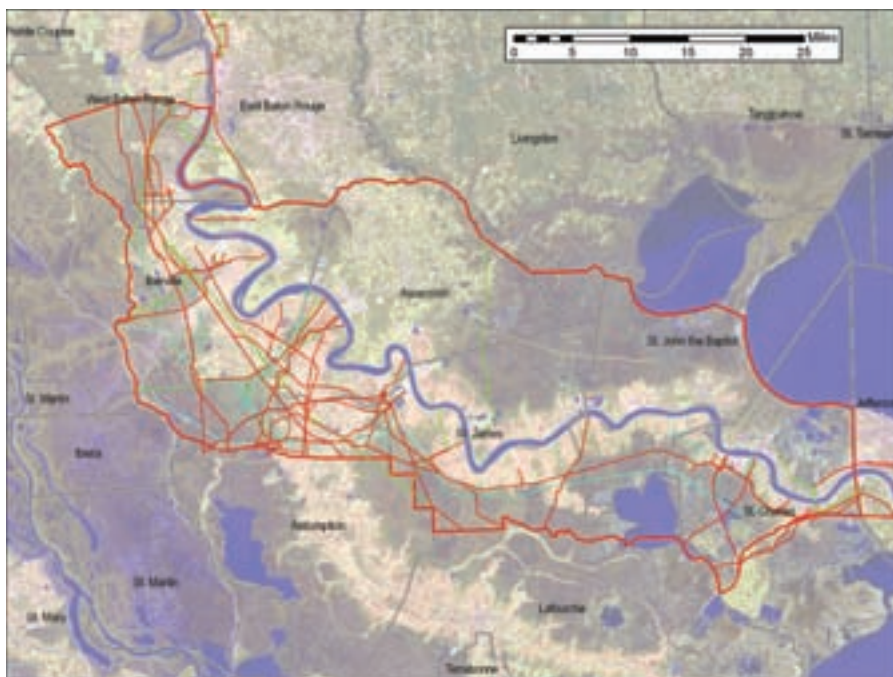
A revenue account project to develop and design a series of color birding trail maps for Fermata Corp intended to accompany a set of publications for the Louisiana Tourist Commission.

Design and Development of a Pre-Cambrian Geologic Map of South Africa

A revenue account project with LSU and Stanford professors to publish an oversize geologic map of the Barberton Greenstone Belt.

Design and Production of a 100K Geologic Map Series in Louisiana

An LGS project to compile, design, prepare, and publish a series of 30 X 60-minute geologic quadrangles of Louisiana. The Bogalusa quadrangle was published in 2007, and the Amite quadrangle has begun.



The above image, developed by LGS research associate Robert Paulsell, depicts digital pipeline data under development between Baton Rouge and New Orleans.

Hydrologic Systems Research Focus of Water & Environment Section

Along with studying Louisiana aquifers—particularly how they interact with each other and with the state's rivers, lakes, and wetlands – the LGS Water and Environment Section also researches water quality and the ways in which natural and man made pollutants are distributed and move within aquifers, as well as interactions with surface water bodies. The results of this research into the state's hydrologic systems allow the LGS to provide effective technical assistance/support to various stakeholders of Louisiana water resources, thus aiding in Louisiana's management of this valuable resource. The LGS Water & Environment projects include:

Assessment of the Impact of Hurricanes Katrina and Rita's storm surge on the Southern Hills Aquifer System in Southern St. Tammany and Tangipahoa Parishes

The PI collected and analyzed information used to assess the damage to the Southern Hills Aquifer from Hurricanes Katrina and Rita saltwater surge waters. The PI monitored ongoing improvements through property owner pumping and well rehabilitation and assessed the risk of possible additional long term impairment of the ground water from infiltration of lake water into the subsurface. By using a combination of geophysical surveying and groundwater sampling, the researchers determine the depth of saltwater intrusion in the aquifer. The data used and assessment of the direct impact of saltwater intrusion through damaged wells was reported to the Louisiana Water Resources Research Institute in May 2007. This research provides public health officials with important information to identify water supply issues after a hurricane makes landfall causing coastal flooding. The research has culminated into two referred publications (one published December 2007 and one in print) and an LGS report is being drafted.

Regional groundwater model of the Southern Hills Aquifer System

The project includes the characterization and groundwater flow modeling of the Southern Hills Aquifer System of Southeastern Louisiana. The study includes the areas adjacent and to the east of the Mississippi River. The geology and geohydrology of the aquifer system is being documented and characterized. Scientific data, in addition from that of the Louisiana Geological Survey, is being gathered from the LA DOTD, LA DNR, LA DEQ, USGS, MS DEQ and other private/corporate sources. A conceptual model of the hydrogeologic setting will be generated and incorporated in a numerical groundwater flow model. The model will be calibrated, tested under a variety of scenarios, and a sensitivity analysis performed. The USGS finite differ-

ence modeling program MODFLOW will culminate into a groundwater management tool for water planner in the subject parishes. Contacts have been made with interested parties to fund part of the project.

Extent of disease risk from lignite within aquifers of northwestern Louisiana

Groundwater samples were collected and were/are being analyzed to assess the impact of lignite on groundwater characteristics. The study compares the concentration of chemical constituents known to have a strong correlation with kidney diseases in humans with the aquifers' geology (as described in water well logs).

Geologic Characterization of the Chicot/Atchafalaya Aquifer System, Southwest Louisiana

This project has been completed and the manuscript, which will be in the form of a Folio containing detailed geologic crosssections with accompanying text, is in final review and editing before publication later this year (2008).



LGS Assistant Director John Johnston developed and began overseeing Geologic Review in 1982.

Geologic Review: Protecting Environment for 25 Years

Geologic Review (GR), a program 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), continued its successful protection of the environment during 2004-2005. Oil and gas permit applications made to these two agencies, which involved environmental impact to wetlands or other environmentally sensitive areas, had their geology, engineering, lease, and site-specific data—and sometimes their economic data—reviewed and evaluated by LGS assistant director John E Johnston III to determine if there was a less-damaging feasible alternative available. These alternatives involved such concepts as reducing the size of ring levees and slips, reducing the length of board roads and canals, the use of directional drillings, and the use of alternate and less-damaging access routes, which still allowed the well to be drilled while avoiding or minimizing any environmental damage involved. Geologic Review 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 animal reduction in permitted impact footage versus requested footage of 85+% is not uncommon. The long-term effect of Geologic Review has been an overall 75% reduction in the average length of canals and board roads built in the Louisiana Coastal Zone.

LGS Resource Center One of a Kind in State

The Louisiana Geologic Survey Resource Center is located on the LSU campus and consists of a core repository and a well log library. This Center is also an integral part of the Louisiana Museum of Natural History, as designated by the state legislature. This is the only facility of its kind in Louisiana and has collections critical for exploration and development of oil and gas in the state, characterization of aquifers, and the practical training and teaching of future industry professionals now studying at LSU and other universities. The headline issues of climate change and carbon sequestration heighten the need for proper storage of the core collections, which are critical for evaluating reservoirs suitable for carbon sequestration. The well log library contains over 50,000 well logs from wells drilled in the state and offshore. Details of current holdings are posted in the LGS Web site (www.lgs.lsu.edu) under Publications and Data. The LGS Resource Center is available for use by industry, academia, government agencies, and those who may be interested. Appointments can be made by calling 225/578-8590.

Outreach & Education Important Part of LGS Mission

Outreach and educational activities have been an integral part of the LGS mission since its establishment in 1934. In July, LGS co-sponsored a one day symposium titled "Geologic Facts of Life for Flood Protection" with the New Orleans Geological Society and the Southeast Flood Protection Authority-West.

The Earth Science Week was celebrated from October 14-20, 2007, and Governor Kathleen Blanco issued a proclamation for Earth Science Week at the request of LGS. This week is organized nationally by the American Geological Institute.

LGS had an exhibit booth at the Gulf Coast Geological Societies Meeting (October 21-23, 2007) at Corpus Christi, Texas, and the Gulf Coast Prospect Expo (September 24-26, 2007). The booth displays included LGS publications and maps together with a list and information on the ongoing LGS Research Projects. Riley Milner was the booth manager and was assisted by LGS Staff attending the meeting.

LGS staff made geological presentations to the Kiwanis Club (Rick McCulloh), Trinity Episcopal Day School (Thomas Van Biersel and Riley Milner), and Kenilworth Middle School (Warren Schulingkamp) and the LSU Museum (Rick McCulloh) during the course of the year.

LGS co-sponsored the First Annual Louisiana Groundwater Symposium in March 2007 with the Baton Rouge Geological Society, held at the Energy, Coast and Environment Conference auditorium in Baton Rouge. It was very well attended, and plans are to continue the symposium on an annual basis. Douglas Carlson, assistant professor, was the main event organizer.

The Survey Staff continue to answer many requests for information from citizens and other state agencies. LGS also provides geological educational material to school teachers and other persons as requested and available.

LGS Staff Recognition

Assistant professor Douglas Carlson is currently the vice president of the Baton Rouge Geological Society. He is responsible for arranging speakers at the monthly lunch meetings of the Society. He is also the Gulf Coast Section representative of the Division of Environmental Geology of the American Association of Petroleum Geologists.

Assistant professor Thomas Van Biersel is 2007-2008 secretary of the Baton Rouge Geological Society. He is responsible for maintaining the Society's records.

Director and state geologist, Chacko John is the president of the Association of American State Geologists (AASG) for 2007-2008. This year (2008) is also the Centennial Year of AASG, and the Annual and Centennial Conference will be held at Shepardstown, W.V. from June 28-July 2. He is also a member of the Nominating Committee for the Southeast Louisiana Flood Protection Authority East and West which was established by Act 1 of the First Extraordinary Session of the Louisiana Legislators in 2006. He continues to be the business representative of the Gulf Coast Section of the Society of Sedimentary Geology.

Research associate Paul Heinrich was field trip leader to the Brushy Creek Impact Structure, St. Helena Parish, in December 2007, held after the "First LSU Impact Colloquium" at the LSU Department of Geology, where he also presented a paper on the subject.



Thomas P. Van Biersel, assistant professor-research, discusses groundwater with Trinity Episcopal Day School second-graders as part of LGS's education and outreach program.

The headline issues of climate change and carbon sequestration heighten the need for proper storage of the core collections, which are critical for evaluating reservoirs suitable for carbon sequestration.

Visit www.lgs.lsu.edu for a complete list of Louisiana Geological Survey publications and projects.

The Louisiana Applied and Educational Oil Spill Research and Development Program

www.osradp.lsu.edu

The common goal of all of these efforts is the same: 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.

In some geographic regions, interest in oil spill research may be waning, but 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. The OSRADP has an annual research budget of \$530,000 and underwrites 10 to 15 projects annually, under the direction of Don Davis. Since the fall of 1993, the OSRADP has granted 149 subcontracts/letter agreements in support of 102 projects—47 were funded for two years; \$43,583 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 common goal of all of these efforts is the same: 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.

In this regard, the program has partnered with Clean Gulf, an industry-wide annual meeting, to showcase our research projects. In October or November, Clean Gulf hosts a meeting, near or on the Gulf of Mexico. The day before the formal sessions, we host, or co-host, a day-long meeting highlighting research funded by the OSRADP or other national or regional oil spill programs.

Funded Projects

OSRADP's four research initiatives are spill of opportunity; education, training, and public awareness; remote sensing and mapping; and spill response cleanup and harmful ecological consequences. The scientific merit of a project is judged on its capacity to 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

Six projects have benefited from spill-of-opportunity funds, which support the application and evaluation of new and/or experimental technology to enhance the recovery of spilled oil or to test experimental cleanup techniques in a field situation. Monitoring may be necessary to prove results, but it is not the focus of the program.

Education, Training and Public Awareness

OSRADP's mission emphasizes education, training, and public awareness. The program originally focused on educating middle and senior high school students about



Plant scientists funded through OSRADP determine the diesel oil tolerance of coastal marsh plants.

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 distributed to science educators throughout the state. Currently, a group of teachers is currently teaching other teachers how to incorporate the material into their lessons, providing an introduction for students to computer-driven geographic information systems.

To better serve one segment of the research community, the OSRADP has funded the development of: *Dispersants: an electronic bibliography on effectiveness, technological advances, and toxicological effects*. The bibliography, currently under development, will have more than 2000 citations, with, where available, annotations to help the research community and others better assess dispersants and their use worldwide. The beta version has been favorably received by a broad cross-section of the user community.

In addition, the Louisiana Oil Spill Coordinator's office has issued the *Louisiana GIS Digital MapMay 2007 Compilation DVD Set*. This two (2) DVD set is a compilation of all previously released Louisiana GIS CD and DVD geospatial data sets. There are 460 geospatial sources on the DVD that are publicly available and pertinent to oil spill prevention, contingency planning, response, damage assessment, and environmental restoration. In addition, the DVD includes revised and updated data and numerous new data layers from contributing agencies. Ten thousand copies of the DVD have been produced. More information on this product can be obtained at <http://lagic.lsu.edu/geodata>.

Because plants improve soil chemistry and structure and contribute to ecosystem function, scientists have focused their research on re-establishing vegetation on oil and oil brine spill sites and accelerating restoration.

To help local governments use the Oil Spill Coordinator's office, or the OSRADP-funded remote sensing products, a project involving the development of oil-spill sharing protocols with local governments was funded as well. The object was to provide an educational tool to help understand the data available for first responders and others.

Remote Sensing and Mapping

In Louisiana, approximately 30,000 oil and/or gas wells are in production (at least 230,000 are in existence). Oil and/or gas are produced in every parish. Each well, along with its ancillary support services, represents a potential spill site, along with the extensive intra and interstate distribution network. The *Louisiana Oil Spill Contingency Plan Map*, available on CD-ROM with appropriate GIS overlays on the Internet, is an invaluable resource for the industry.

Also available are "Boat ramp and launch site inventory, southwest Louisiana coast zone" and "Oil and hazardous spill access point inventory for southeast Louisiana," now part of the state's GIS, which provide information on waterway access points throughout south Louisiana's lower tier of parishes—a resource critical in rapid response to oil spills on water and wetlands. An updated version of this inventory is under development and can be viewed at: <http://levee.lagic.lsu.edu/marinas>.

Land/water interface boundaries in the state are important to spill planners, as they change quickly in coastal areas. *"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.

To better assess shoreline changes, the program has funded a project: *Derivation of an elevation tagged shoreline (land/water interface) from LOSCO/FEMA/LIDAR data in the coastal zone*. When completed, this project will give responders, government trustees, and others a better understanding of the complexities of the Louisiana's coastal lowlands.

The highly complex pipeline network of the state's 100-plus-year-old oil and gas industry has not been thoroughly 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).

OSRADP partially funds the *"Wave-current online information system for oil spill contingency planning,"* an online oceanographic and meteorological observing system 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 archiving, 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 seasons. The program continues to provide small awards to help the research team further the WAVCIS mission and objective.

Spill Response, Cleanup and Harmful Ecological Consequences

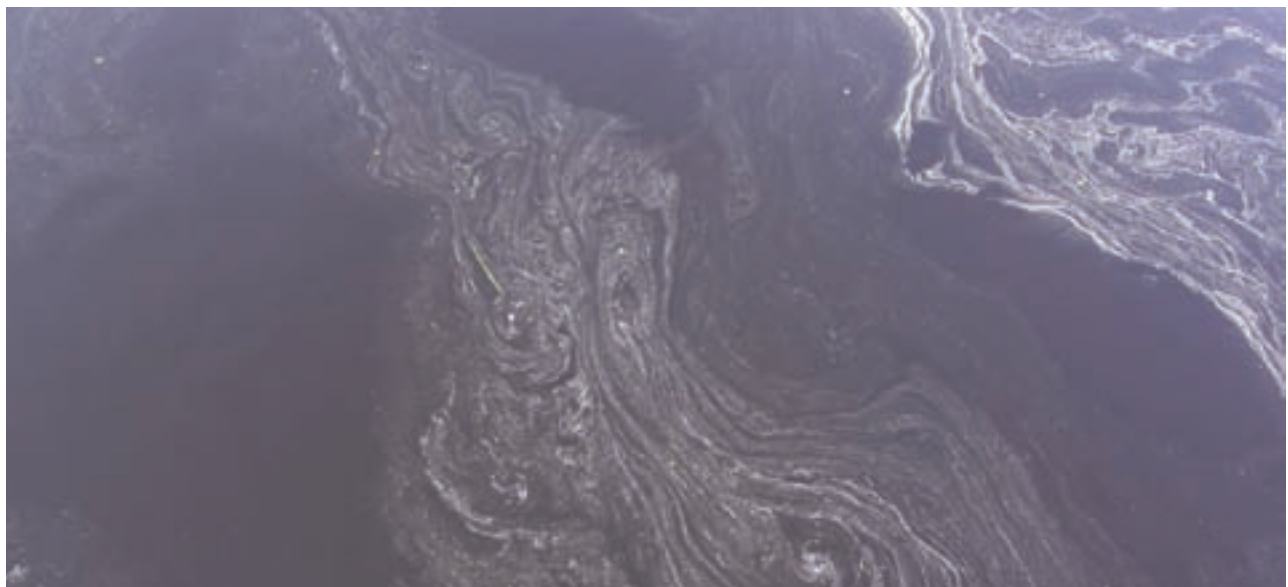
A series of studies involving in-situ burning has been initiated to address the environmental effects of wetland spill cleanup. They include

- *“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”;*
- *“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.”*

The results of laboratory and field trial show that 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.

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

- *“Quantitative evaluation of in-situ fluorometry for continuous monitoring during near shore dispersant applications”;*
- *“Dispersant effects of wetland vegetation: toxicity evaluation and oil remediation”;*
- *“Strain selection of AM fungi for restoration of oil/brine spill sites”;*
- *“Rates of recovery of crude oil in sediments development of the Meraux canal system as a long-term recovery study site”;*
- *“The completion of a comprehensive investigation of pioneer plant species and oil stress indicators for successful restoration and remediation of oil-impacted wetlands”;*
- *“Nitrogen cycling in oil brine contaminated areas”;* and
- *“Pioneering plants to remediate oil and brine spills.”*



Radiation Safety Office

www.radsafety.lsu.edu

Per the Louisiana State University System's Radioactive Material License issued by the Louisiana Department of Environmental Quality (DEQ), the Radiation Safety Office (RSO), under the direction and supervision of the Radiation Safety Committee, is responsible for implementing radiation control policies and ensuring safety practice to not only be fully in compliance with the federal and state regulations but also assure individual well-being and the integrity of the University.



Wei-Hsung Wang directs the LSU Radiation Protection Program.

The radiation protection program is conducted in such a manner so that radiation exposure to faculty, staff, students, the general public, and the environment will be maintained as low as reasonably achievable and that no radiation exposure will be received without societal benefit. This mission is to be accomplished without hindering legitimate research or realistic teaching objectives.

Approval of the RSO must be obtained for all procurement of radioactive materials and radiation producing equipment, all teaching and laboratory uses, research and development projects, as well as any other activities with potential radiological hazards, all contracts and grant proposals involving sources of radiation, all personnel who will directly use sources of radiation, and all facilities, construction, outfitting, and renovation involving sources of radiation.

The RSO provides training and personnel monitoring for persons who use sources of radiation as well as performs routine site surveys and audits, meter calibrations, radioactive waste management, and leak tests of sealed sources for approved radiation laboratories to be consistent with the related regulations and Radioactive Material License conditions. Currently there are about 800 approved radiation workers (including 127 principal investigators) and 211 radiation laboratories at Louisiana State University (LSU), Agricultural Center (AgCenter), and Pennington Biomedical Research Center (PBRC).

DEQ Inspects Radiation Protection Program

During the past year, inspectors from DEQ's Emergency and Radiological Services Division carried out three inspections of the radiation protection program for LSU, AgCenter, and PBRC. The inspectors examined the policies and procedures and verified the implemented security control measures in accordance with the Nuclear Regulatory Commission Order Imposing Increased Controls. The inspections also included reviews of the records of individual and area radiation exposure monitoring, inventory verification under each approved principal investigator, leak tests of sealed sources, Radiation Safety Committee meetings, survey meter calibration, radioactive waste disposal, radiation laboratory contamination surveys, radioactive material shipments, radiation user training, current Radioactive Material License, semi-annual radiation laboratory inspections, procedures for ordering radioactive materials, and refresher training. Inspectors walked through various types of x-ray units and radiation laboratories to check radiation levels, function of the x-ray units, calibration and condition of survey meters, posting requirements, and security in these laboratories. One minor concern regarding the determination of trustworthiness and reliability of individuals with unescorted access was noted. Within five days, corrective actions were in place. A follow-up inspection also verified that this concern had been rectified.



Pictured at left: RSO laser safety officer Mary Haik performs a regular inspection on a diagnostic C-arm fluoroscopy imaging system in the Football Operations Building.

Pictured above: Radiation specialist Cade Register and assistant Ben Bourque carry out a routine radiation survey for analytical x-ray diffraction equipment, which is used for crystal structure analysis.

Course Presents Applied Radiation Protection Training

The Radiation Safety Office has been sponsoring a well-received five-day course titled *"Selected Topics in Radiological Protection"* for the past 23 years. The objective of this course is to present the basic principles of radiation safety to engineers, scientists, managers, and other technical personnel. Attendees this year included people from the U.S. Department of Homeland Security, the Kansas Division of Emergency Management, the Louisiana Department of Environmental Quality, Total Safety U.S., Inc. (a global leader in providing safety service), and Expro Americas, Inc. (a leader in well flow management).

FACES Lab Acquires X-ray Unit

Mary H. Manhein, director of Forensic Anthropology and Computer Enhancement Service (FACES) Laboratory, procured a portable dental x-ray unit to collect dental data on unidentified and missing persons statewide, based on the Louisiana Repository for Unidentified and Missing Persons Information Program. To use the device to collect the required dental data in the most effective and efficient manner, a petition for an exemption from two regulations of the Louisiana Administrative Code was submitted to DEQ. The exemption from the current regulatory requirements is vital for the on-site dental data collection, since the cadavers may be in advanced stages of decomposition. Then assistant DEQ secretary Harold Leggett granted approval with only minor conditions.

Currently there are about 800 approved radiation workers (including 127 principal investigators) and 211 radiation laboratories at Louisiana State University (LSU), Agricultural Center (AgCenter), and Pennington Biomedical Research Center (PBRC).



The multicolored map is 54 x 60 inches at a scale of 1:380, 160. It depicts the crude oil and natural gas fields of Louisiana and their active and depleted areas, including those in Louisiana state waters.

Oil and Gas Field Map of Louisiana 2008

The Louisiana Geological Survey has prepared a new oil and gas field map of the state under contract from the Louisiana Department of Natural Resources. The map will be published in May. DNR will distribute the map to a limited number of users in its mission of planning and regulating the state's resources. Additional copies will be available to the public from the Louisiana Geological Survey publication sales office.

Contact:
Louisiana Geological Survey
Louisiana State University
Baton Rouge, LA 70808

Phone: 225/578-5320
Fax: 225/578-3454
www.lgs.lsu.edu



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